THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXII. No. 1836.] LONDON, JULY 19, 1898. [50TH YEAR. PRICE 6d.

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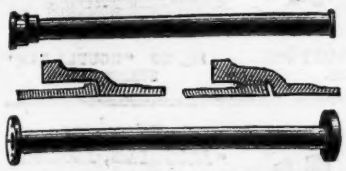

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Fig. 808. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

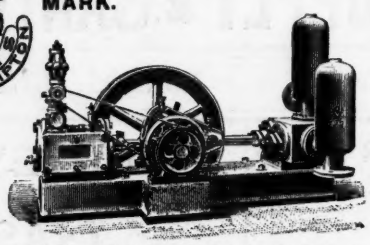

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

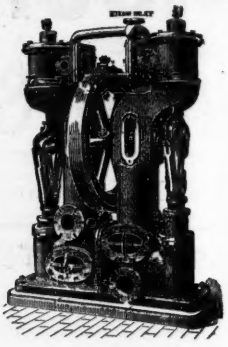

Fig. 712 "DOUBLE-RAM" STEAM-PUMP.

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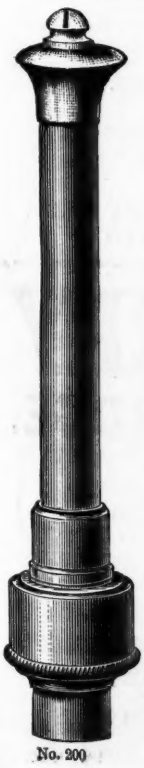

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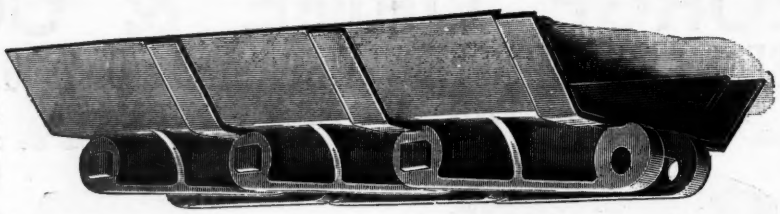

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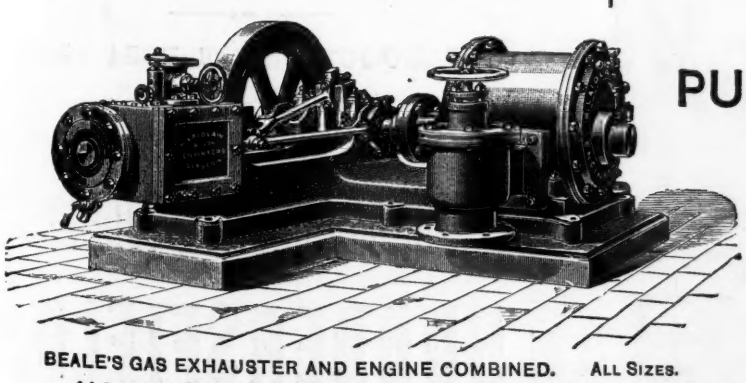

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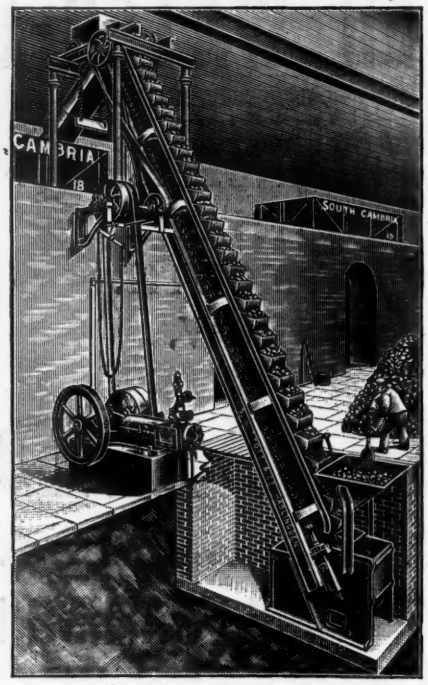

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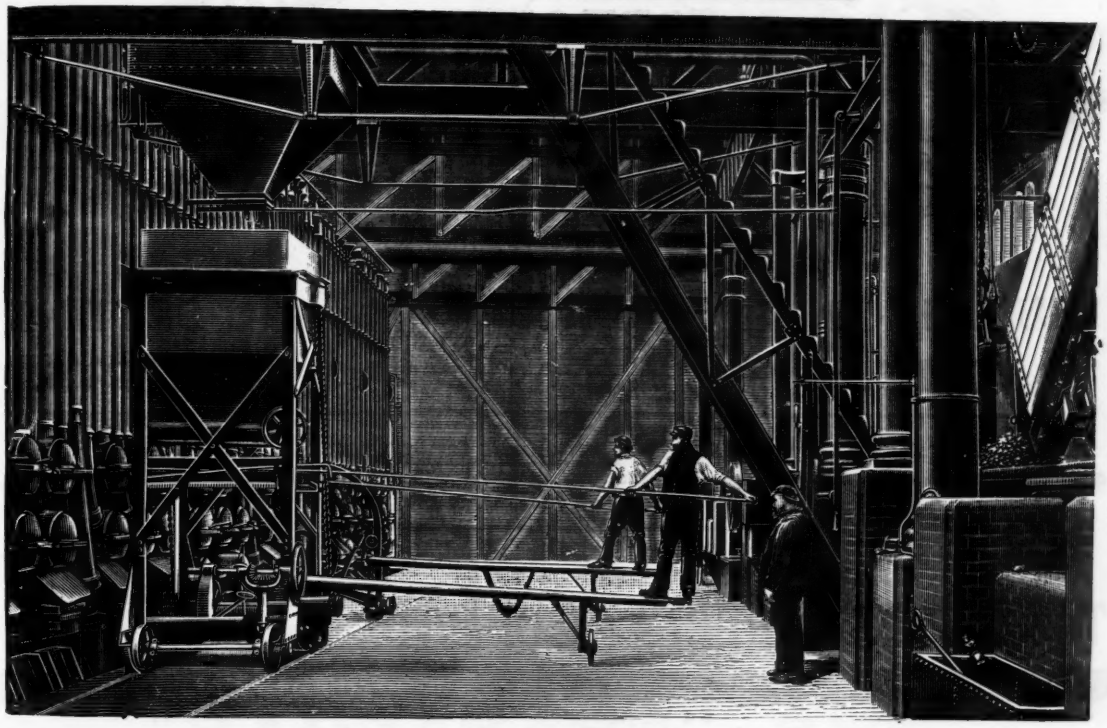

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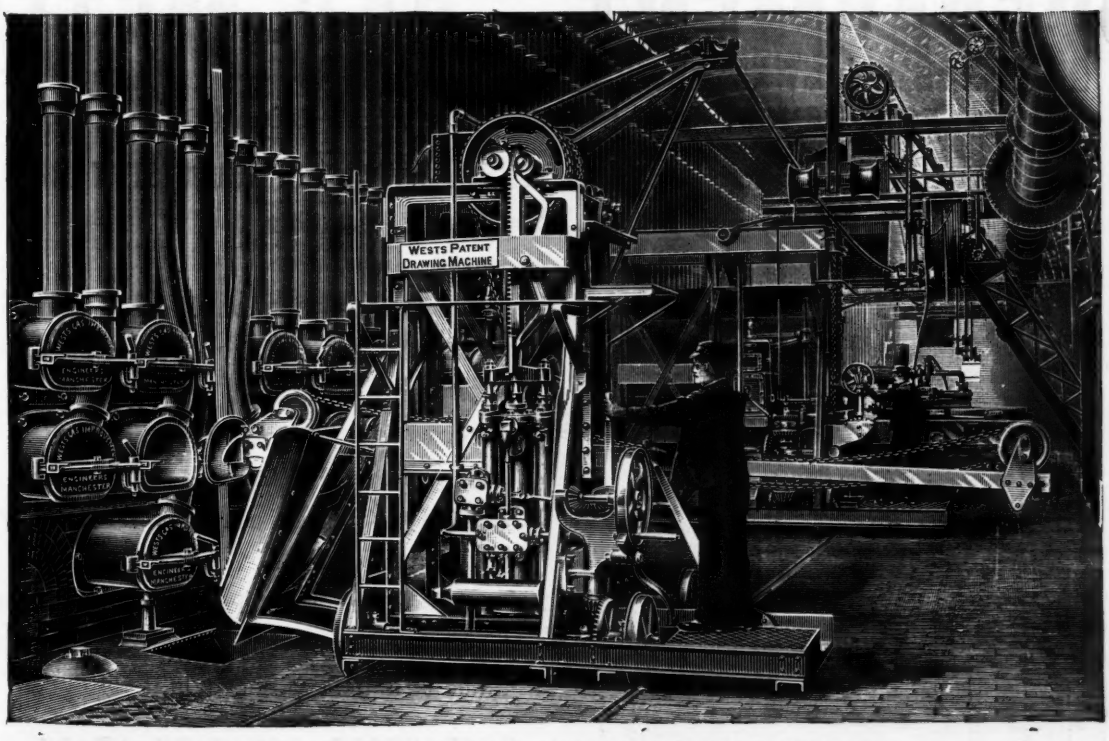

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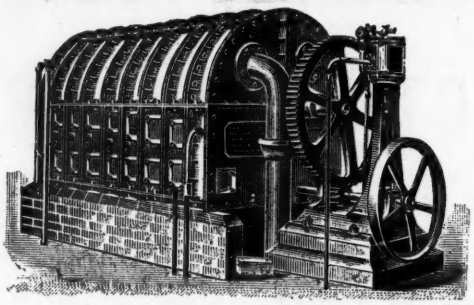

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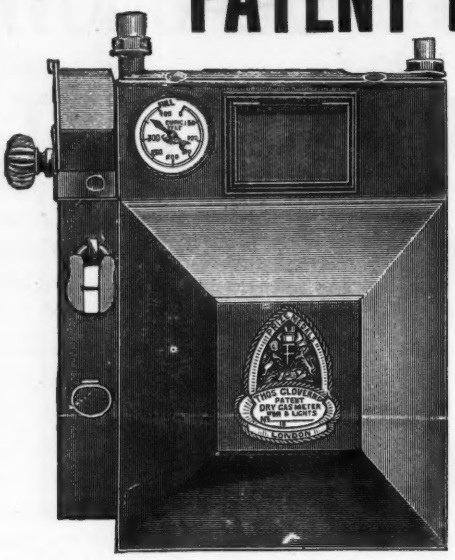

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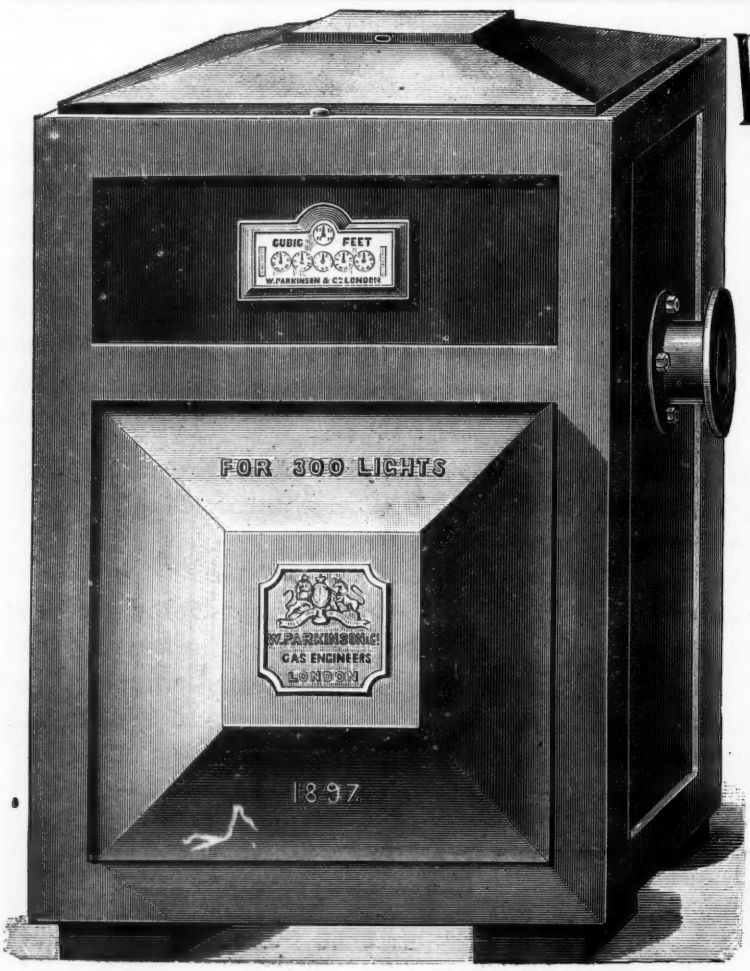

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EDITORIAL NOTES.

Passing of The Gaslight and Coke Company's Bill through the Lords.

THE Gaslight and Coke Company's Bill came before the House of Lords Committee on Wednesday last, and was opposed by the London County Council. The case presented by the promoters was that this is a measure purely for converting and consolidating the Company's unwieldy and multitudinous stocks; while the opposition argued that the operation in question would be so much to the benefit of the Company that they ought to show they had deserved the boon by their treatment of the public. It was the case as submitted to the other House over again, with no material alteration. The promoters pleaded that everything as regards the relations of the undertakers to the consumers or the Local Authorities would remain absolutely unaffected by the Bill. The County Council replied that the measure would enhance the value of the Company's stock, which would affect the ultimate price of the undertaking in the event of purchase. As was said before the Commons Committee, the market price of a gas company's stock is never taken into account in determining the value of the undertaking for its transfer to a local authority; but there is never a transfer arbitration held at which this price is not mentioned. In the result, the present Committee passed the preamble of the Bill; but they inserted a clause to make sure that, in the event of purchase of the undertaking, the market price of the stock shall not be taken into consideration by the arbitrator who values the property for the purpose. This may be regarded as a piece of superfluous caution; but it is an indication of the temper of the Committee that is not to be despised. It is evidently thought that the value of gas property is high enough, without any possible addition by virtue of legislative or financial operations.

The Report of the Petroleum Committee.

AT last, after four years' labour, the Petroleum Committee have reported to the House of Commons. The value of this piece of information, as news, is discounted by the disclosures already made in these columns respecting the nature of the conclusions arrived at by the Committee. It has been known in this way that the Committee were irreconcilably divided into "high-flash" and "low-flash" parties. It has now transpired that the report was only saved for Parliament, at the last meeting, by an expedient which deprives the finding of the Committee, in regard to the desirability of raising the flash-point of burning oil, of the little authority it ever possessed. As the "Daily "News" stated it on Thursday: "Those members of the "Committee who had agreed with the Chairman in "opposing the raising of the flash-point were yesterday "in a majority, and could have rejected the report by a "majority of two. They still felt unable to support it so "long as it contained the recommendation which was "inserted some weeks ago. In view, however, of the "practical value of other recommendations, especially as "to storage and transport of petroleum, and in order that "the work of the Committee should not prove futile and "without result, two of the majority withdrew from the "room to avoid voting when the final question was put, "and the Chairman did not vote, which enabled the "advocates of the high flash-point to carry the report "by a majority of one." And very much good may this hollow victory do the high-flash party. The nature of the vote that saved the report being thus explained, it is possible to discuss the Committee's recommendations in the calm spirit appropriate to their academic character. The Committee recommend the bringing in of a Bill to remedy the defects of the existing law as regards the control of the trade in, and use of, petroleum oil and spirit. It is considered that there should be legislation for the petroleum trade generally, certain heavy oils alone excepted. The flash-point of 100°, Abel close test, is recommended as the dividing-line between petroleum oil and petroleum spirit. With regard to lamps, it is found "that the number of lamp accidents has not increased out "of proportion to the vast increase of the number of lamps "in use, and that ordinary care should be used whether "the flash-point be raised or not." If perfect immunity from accidents is to be secured, the evidence shows that it will be necessary to prevent the use of all petroleum below 120°, Abel close test, the effect of which would be to

materially increase the price of oil to the consumer. It is considered that the manufacture of lamps could be regulated in the interest of public safety by the Home Secretary; and the Committee agree with the suggestion that children in elementary schools should be instructed in the proper use and care of lamps.

A letter from Mr. Jesse Collings, the Chairman of the Committee, follows the publication of the substance of the report in last Thursday's "Times." Mr. Collings remarks that he has been visited with a vast amount of misrepresentation, to say nothing of personal abuse, from certain quarters, on account of his known opposition to the raising of the flash-point of lamp oil. He shrewdly observes that, though the Committee was appointed by Parliament in the interests of public safety, this was not the consideration that governed the course of the inquiry. It was trade interests—American, Scottish, and Russian—that occupied the first position. This being the case, it behoved those upon whom rested the chief responsibility for the conduct of the inquiry—especially the Chairman—to see that the Committee were not made the tools of any private and particular interest. For trying to do his duty in this regard, Mr. Collings has been vilified most shamelessly in certain of the low-class newspapers, which, according to the manner of their kind, have persistently misrepresented facts, and repeated false statements with greater effrontery the more often they have been exposed. A favourite lie is that by the Act of 1879 the flash-point was lowered from 100° to 73°; the fact being that all that was done was to substitute a reliable for an unreliable test—the results being absolutely equivalent. Another misstatement is that England is merely the "dumping-ground" for the refuse product of the Standard Oil Company. This assertion has been disproved over and over again; but it is repeated on the general principle that the baldest lie is certain to be believed by some people, if only it is told often enough. Mr. Collings shows that, so far from being opposed to any revision of the flash-point for any purpose, he was willing to raise it to 150°, Abel close test, for the sake of imposing a few simple regulations in the cause of public safety. But this did not suit the Scotch oil interest; and so it was not accepted. Mr. Collings compliments Mr. Ure upon having "championed the Scottish case with conspicuous "ability and persistence;" but, as a matter of fact, this championing was a little too strenuous. As a result, the whole report exhales the odour of paraffin oil, which is little admired out of the lowlands of Scotland.

Saving the Time of Association Meetings.

It is with much pleasure that we are able to do something to restore the credit of American gas engineering, gravely shaken by the report, to which we have given currency, that labour-saving processes and appliances are not so largely employed in American as they are in British gas-works. Whatever may be the case of American gas-works in this regard, American gas engineers, when assembled in conference, have just perfected a labour and time saving practice which is to be heartily commended to the favourable attention of their English brethren. We allude to the method of dealing with those painful episodes of technical society meetings that belong to the category of "compli- "mentary votes and votes of thanks." At the close of every meeting of a professional society, custom ordains that precious time shall be wasted in moving, seconding, and passing a long series of perfunctory votes. Nobody has the courage to protest against this ceremonial thanking of auditors, scrutineers, and other worthy people who have only performed duties which they were perfectly willing to undertake, and for doing which they certainly do not need the formal gratuity of a vote. It often happens that valuable papers have to be taken as read, or helpful discussions remorselessly cut short, for the sake of this painful performance. Now, mark how this waste of time was checked at the recent meeting of the Western Gas Association of America. There was appointed, at the commencement of the proceedings, a Committee on Final Resolutions, who reported at the end of the technical business. This report contained all the polite and pretty commonplaces of which Englishmen deliver themselves with such obvious effort on these occasions. The Mayor of the City was thanked for his courtesy in welcoming the meeting; the member who acknowledged the act of courtesy was remembered; the retiring President was complimented; and everybody received his sugar-plum wrapped up in the neatest style. The adoption of the report settled the whole thing by a single vote loaded with enthusiasm to the elastic limit! A capital arrangement, ensuring that politeness should not be wanting, nor trench unduly upon the scanty working minutes of the meeting.

The Annual Meeting of the Society of Chemical Industry—The Endowment of Research.

The annual meeting of the Society of Chemical Industry was held in Nottingham last week, under the presidency of Professor Clowes; and a report of the proceedings will be found in another column. There has been a considerable accession to the membership of the Society during the past year; making it the largest organization in the kingdom in connection with chemistry. The Presidential Address was very largely in praise of the Society, in which Dr. Clowes is known to be an enthusiastic believer. He is succeeded in the chair by Mr. George Beilby, well known as a leader of the shale oil industry. The Society's medal was awarded to Dr. Perkin, who returned thanks in a speech warmly defending the cause of research. It is a coincidence that on the very same day Mr. A. J. Balfour, in distributing the prizes to the Guy's Hospital students, spoke eloquently upon the selfsame theme. Everybody agrees that, if knowledge is to increase, it must be added to by those who have nothing else to do. The practitioners of a profession founded upon certain applications of systematized knowledge, which is called science, cannot do much, as Mr. Balfour very truly said, towards the advancement of their science. It is as much as they can do to keep abreast of it. The pure student must carry the lamp into the dark places where Nature keeps her secrets, but rarely her convertible treasures. But the student must live; and the difficulty is to persuade the world that he is worth keeping alive, though he does not contribute anything material to its resources. The endowment of research is a well-worn subject of discussion; but somehow the cause is not making much, if any, progress in this country. Time was when pious benefactors generously endowed learning—founding Chairs and Fellowships at Universities with no expectation that those who benefited by their beneficence would make any practical return for it. Modern millionaires seem to have other views; but the old one was not to be despised.

Failure of "Conciliation" in South Wales.

A little flutter of the "popular" Press was caused last week by the announcement that the Associated Employers had refused to meet Sir Edward Fry, the "Conciliator" appointed by the Board of Trade to deal as best he might with the South Wales coal trouble. On Saturday week, Sir Edward had his first interview with the men's representatives at Cardiff, and arranged to meet a full Committee in the town on Wednesday. This second meeting duly came off; but it transpired that meanwhile Sir Thomas Lewis had seen Sir Edward Fry, and informed him that the Associated Employers declined to recognize his position as Conciliator. Sir Thomas further stated that "the "Associated Employers declined to admit any intervention "of the Conciliator, or of any other person appointed by "the Government or otherwise; but that the Associated "Employers are prepared to meet the authorized repre- "sentatives of the men, but without the presence of the "Conciliator." The comment of some newspapers upon this is that, in refusing to have anything to do with the Conciliator, the employers are taking upon themselves a grave responsibility; and they contrast with the refusal of the employers the willingness of the men to accept conciliation. But this is just the confusion of thought in regard to the essential conditions of a settlement into which an outsider with a prejudice for the "democratic" view of the emergency might be expected to fall. When two parties quarrel, it is themselves who must make it up again. All that a mutual friend can do to help forward this process is to act as a go-between for the purpose of bringing them together. The case of the South Wales coalowners is that they have been willing to meet their men all along; while the latter have held aloof. They say informally to Sir Edward Fry that neither he nor anybody else can make them more willing to meet the men than they are at the present time; and therefore they have no use whatever for him. To do them justice, the men seem to understand this better than their newspaper partisans; for they have agreed that their own Secretary

should make overtures to the Coalowners' Secretary for a meeting to discuss a new set of terms. What the precise nature of these terms is has not transpired. It is believed, however, that the men are at length prepared to discuss a sliding-scale of wages; but they cling to the desire for a recognized minimum below which wages are not to fall. All this means that the masters are slowly, but surely, carrying their point. One by one the crude socialistic demands of the strikers are being dropped; and they will come at last to meet the employers upon the plain, straightforward plan of mutual adjustment of wages and prices that has been open for them from the beginning of their ill-advised revolt.

Public Opinion and the Report of the Old-Age Pension Committee.

PUBLIC opinion regarding the report of the Committee on Old-Age Pensions seems to be fairly summarized in the observation that people did not want a Committee presided over by Lord Rothschild to tell them that if they could save enough money they would keep out of the workhouse. There seems to be much dissatisfaction at the limitations imposed upon the Committee by, or accepted by them as deducible from, the terms of the reference. We are not singular in feeling disappointed that the Committee were not able to criticize the German system of State-aided insurance of workpeople. Mr. Lionel Holland, M.P., has written to "The Times" complaining that the "unfortunate "decision in regard to the limitations" which were imposed upon the inquiry, "which tended towards making it "imperfect and nugatory," was aggravated by the neglect of the Committee to petition for a fuller reference. The result has been to waste two years upon a barren inquiry confined to a class of proposals upon which a Royal Commission had already passed judgment.

Speaking for a really important national industry, we are very sorry that the eminent men who composed the Committee left out of consideration the most hopeful class of proposals—those in which employers and employed combine to procure the realization of those provisions which the Committee were charged to investigate with a view to rendering them universal. The great national industries of this country are passing through a crisis which is not the less acute for being spread over a long period of time. There are those who hold that the flowing tide of British prosperity has reached the high-water mark; and that the start which peace at home, good government, early-developed communications, and the first applications of steam power gave this country, is now spent. The United States and the Germanic countries of the European Continent are overhauling us fast on both sides; and British manufacturers and workmen will have to deal with very different trade conditions in the future from anything they have experienced in the past. If we can put our house in order betimes, it will be wisdom to do so; and one of the matters not yet cleared up at home is the relation that should exist for the future between capital and labour in industry. The Workmen's Compensation Act is a step in the direction of this re-settlement; and it has been remarked with great force that the Act is the beginning of poor-law reform.

In the gas industry, there are many wise and far-seeing administrators who would fain make workmen's compensation for accidents part only of a general scheme for charging the profits of the industry with the cost of maintaining its workpeople—using the term in the very widest sense. This is already done in numerous undertakings, for whose employees the poor law is only a name of something outside their sphere of activity. But very much remains to be done in this way; and those who admire English Municipalism so much will do well to take notice that our local authorities do not occupy the foremost place in this movement. The truth of the matter is that modern democracy wants to be educated in economic science—not merely in the dry-as-dust political economy that only has to do with accomplished facts and ascertained statistics, but in that kinetic form of the science which treats of the living forces of trade and industry, and admits the humanity of both employers and employed. Public opinion has to be manufactured and guided to the settlement of these greater questions of industry; and it is because there is so little help in the report of the Old-Age Committee that those who feel that "something must be done" are so disappointed with it. For in the body politic as in the case of individuals, when "the faculty" give up a patient, quacks take him in hand—usually with disastrous results.

WATER AND SANITARY AFFAIRS.

ESSEX, supplemented by Hertfordshire, laid a large amount of evidence before the Royal Commission last week. The Chairman of the Water Supply Committee of the Essex County Council testified to a strong feeling against the London County Council coming over the borders of his county. The policy which prevails among the Outer Authorities generally, not only in Essex but in other counties bordering on the Metropolis, seems to be that of shutting up London to itself, and for the outer districts to keep their water supplies in their own hands. Thus it is held in prospect that London, like a besieged city, will have to seek succour in Wales in order to supply its wants; and this affords an extra inducement to the Outer Authorities to keep clear of Spring Gardens, lest they should have to contribute to the cost of the Welsh scheme. Each locality assumes that its resources are sufficient for its own needs; but in order to maintain that sufficiency they must take care to preserve those sources intact in the face of any administrative change. Sir John Evans, who holds the position of Vice-Chairman of the Hertfordshire County Council, stated that "Herts claimed the whole of the water "in the county as belonging to Herts." Sir John carried his theory of exclusiveness and the *status quo* so far, that the Chairman of the Commission asked what the Companies were to do. If they were to obtain no more water from the Thames or the Lea, or from the wells, where were they to get it from? The answer was simply "Wales." But if London has an abundant source at its own doors, why should it spend millions in going further? In any case, what will the outer areas gain by being separated from the general supply of "Water London?" If there is enough water in Outer London to supply the wants of that territory, it will be there whether the area is divided or not. In other words, the Thames, the Lea, and the wells will furnish, as Lord Balfour's Commission showed, enough water to supply all the districts for a long time to come. If ever there is a failure, the need for a Welsh supply will arise in the outer area, where the population is specially increasing. It is outside the Administrative County of London that the great increase of the population is taking place; and there is abundant reason why the ring should cling to the centre, so as to share in the benefit of any comprehensive scheme. Unfortunately, it is the policy of the Council to shake off the outer area; and this ought to convince the Outer Authorities that such separation would not promote their interests. The fear of a "water famine" expressed by Sir J. Evans may well be entertained if an outlying district with an enormous population is to be left to its own resources. A wide area to draw from is the surest defence against a short supply. If Wales must be resorted to, it must be on account of the outlying districts, who nevertheless wish to stand aloof from any such project. If the Administrative County is to be shut in on itself, it will have no need of Wales until a very remote period. This miserable partitioning policy which the Local Authorities round London seek to carry out, is nothing better than suicidal.

A question put by Major-General Scott during the proceedings of the Royal Commission last week brings to view a contingency which has been almost entirely ignored, though we have heard something of it before, and have commented upon it. The General asked: "What is to "prevent the Companies going to Wales also?" Should such a necessity arise, the Companies would assuredly take the requisite action. The ratepayer would then escape all risk. There would be no rate-in-aid, and the consumer would be free from any extra charge. Why not await such an event? In reply to General Scott, Sir J. Evans said: "If the Companies were to join and go to Wales, "that might be a solution of the difficulty." It would be a *quietus* for the Council. But the time has not arrived; and the difficulty has not presented itself. Perhaps the Companies might give some sign that they were ready to go to Wales or anywhere else for water when there was need to do so. If they were to secure a watershed in readiness, so as to hold their own, it would change the situation. It would be amusing to find the County Council protesting against any such prevision. Mr. Andrew Johnston, who appeared before the Commission as the Chairman of the Essex County Council, but who is also the representative of the New River Company on the Staines Reservoirs Committee, said that, if more water was wanted

by the Metropolis generally, Essex would be prepared to pay the cost of bringing it from a distance, "if anybody "could show a better right to Essex water than Essex." Perhaps Mr. Johnston apprehends that Essex may at some time require more water than it can get near at hand. The truth is, a community of interest ought to be felt; and only in that way will a sure guarantee be found against a deficiency in the supply. Much has been said as to the practical importance of effecting a junction between the mains of the several Metropolitan Water Companies. Yet in opposition to this project for giving the whole of "Water London" the command of an undivided supply, there is the notion that the supply all round London should be split up among the several authorities; creating thereby greater diversity and far more of separation than exists at the present time.

The Water Committee have adopted a report to the London County Council, recommending that the Chemist (Dr. Frank Clowes) be authorized to make six examinations per week of the water of each of the eight Water Companies, between the middle of the present month and the end of October. The cost will be £15 a week, or nearly at the rate of £800 per annum. At present there is a weekly charge of £10 for an examination of each water three times in each week. This might be thought a sufficiently heavy charge upon the ratepayers; but, in the judgment of the Council, or at least of the Water Committee, something more is desirable. If all this is necessary on the part of the County Council, why does Sir Edward Frankland report officially every month on the quality of the water? and is there no value in the daily examinations conducted by Sir William Crookes and Professor Dewar? The Water Committee themselves admit that their own Chemist shows a continued improvement in the quality of the London Water Supply. Comparing 1897 with 1891, there is an extensive diminution in the oxidizable matter contained in the water; the river Companies showing in that period a reduction ranging between 57 and 72 per cent. But the Committee have an idea that with an increase of the analyses there will be a further improvement in the water. There will certainly be an increase of expense.

The Index to Vol. LXXI. of the "Journal," January to June, 1898, is now ready; and a copy will be forwarded (post free) by the Publisher, on receipt of a post-card from any Subscriber.

Institution of Junior Engineers.—The summer meeting of the Institution of Junior Engineers, of which Mr. J. A. F. Aspinall (Lancashire and Yorkshire Railway) is President, is to be held at Liverpool from the 8th to the 13th of August. The President-Elect is Sir William H. White, of the Admiralty.

The Dividend of The Gaslight and Coke Company.—We learn from the Secretary and General Manager of The Gaslight and Coke Company, Mr. J. W. Field, that the accounts for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the statutory rate of 12¼ per cent. per annum; carrying forward £51,854 19s. 8d.

North British Association of Gas Managers.—The thirty-seventh annual general meeting of the Association will be held in the Merchants' House, Glasgow, on the 28th and 29th inst., under the presidency of Mr. T. Wilson, of Coatbridge. According to the programme issued by the Secretary (Mr. R. S. Carlow, of Arbroath), there will be five papers for the consideration of the members—viz., "Retort Settings and Practical Results Obtained," by Mr. W. Ewing, of Hamilton; "Prepayment Meters," by Mr. A. Wilson, of Perth; "Automatic Manipulation of Coke," by Mr. Gilbert Little, of Smethwick; "Some Notes on the Modern Commercial Gas-Engine," by Mr. W. Carmichael Peebles, of Edinburgh; "The Cowan Pressure System," by Mr. J. Hepworth, of Edinburgh. On the second day of the meeting, the members and lady friends will have an excursion to Lochranza, and dine at the hotel there.

Illuminating Gas from Sewage.—At the recent annual conference of the Association of Municipal and County Engineers in Edinburgh, Mr. Duncan Cameron, the City Surveyor of Exeter, the inventor of the septic tank system of sewage treatment, communicated a paper on the subject, in which he stated that one of the most notable points observed in the Exeter tank had been the hitherto unrecognized energy stored in sewage, as evidenced by the production of marsh gas. The works and public baths adjoining at Exeter had been lit with the gas and incandescent mantles. He said he had not had more than ten such lights burning at one time; but it was apparent, even under the conditions of leakage existing, that more than twice this number could be kept constantly alight. This estimate was made during the cold, wet weather of last winter. The gas was innocuous, and could only be detected ordinarily by applying a light.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 166.)

THE dulness and inactivity into which the Stock Exchange had relapsed, as noted in our last issue, continued right through the week just closed. There was a most persistent lack of animation, which refused to yield to the influence of one or two favourable incidents of the period—such as the improved prospects of peace, and the successful flotation of the Indian Loan. Prices pretty well throughout the list have gone back accordingly, with hardly an exception beyond some special gilt-edged securities. Discount rates have kept up steadily, but short money was over-abundant; and the limited demand for the Stock Exchange settlement could make no impression upon the excessive supply. Business in Gas fell away to very light proportions on the whole, although one or two issues showed greater activity than usual. The tendency was decidedly favourable, as testified by the leading issues; but one or two of the minor undertakings were otherwise affected. In Gaslights, the "A" was only moderately active; but it made a nice advance from 295¼ on Monday to 300 at the close. The success attending the Company's Bill in the Lords' Committee Room had much to do with this, aided by the subsequent announcement of the dividend-rate and carry over. The Directors are to be congratulated on returning again to a dividend commensurate with the earnings. The increase in the price of gas taking effect in the June Quarter only, they might have recommended a 12½ per cent. rate. Happily they have refrained from doing this, and have laid the foundation of a reserve of undivided profits which we trust may be substantially built up as and when circumstances permit. South Metropolitan was particularly active and firm, and pushed its way from 142 up to 144½. Not much was done in Commercials; but the new stock changed hands at good figures. Suburban and Provincial undertakings were scarcely touched; and no move of any sort was made, except that Brighton went up one day and back the next. The Continentals were quiet generally, though Imperial had a rather lively day on Thursday. The only variation was an advance in Union. Among the rest, the only change was a slight fall in Hong Kong and Oriental new. Business in Water was very quiet, and quite devoid of feature. Quotations were left undisturbed.

The daily operations were: Business opened very lazily in Gas, but all prices tended upward. Brighton and Continental Union rose 2 each; but Hong Kong fell ½. Things were quieter still on Tuesday; and the only move was to put Brighton back again. On Wednesday, business nearly approached the stagnation point. Oriental £4 10s. paid fell ½. Business was much brisker on Thursday—Gaslight issues being in demand, and the "B" 4 per cent. rose 2. On Friday there was less activity, except in South Metropolitan, which was active, and rose 1. Gaslight "A" gained 2½. Saturday was fairly active, and prices were good, although quotations were left unchanged.

ELECTRIC LIGHTING MEMORANDA.

Competition in Electricity Supply—Charing Cross to Supply the City of London—Electricity Retailed at a Penny per Unit.

THE question of competition in electricity supply is still greatly exercising the industry. In this connection, the question of right and wrong appears to be yet in the primitive stage when right is what suits me, and wrong what I do not like. This is a stage of the development of ethics through which, as social philosophers tell us, all civilizations have had to pass. Even now, nations at war invariably regard it as very wrong in "the enemy" to do what they try their best to do themselves. Competition in trade, so economists say, is the modern equivalent of private war. The outcry of certain Metropolitan electricity supply companies against the proposition that parochial electric lighting ventures should be permitted to compete with them has found a strange echo in the proposal of the Charing Cross and Strand Electricity Supply Corporation to invade the City for the purpose of competing with the City of London Company. The arrangements whereby the City was provided with public electric lighting have been much canvassed of late; and it is the fact that private consumers of electricity in this favoured region have had to pay dearly for the benefits enjoyed by the Corporation under the public lighting contracts. The next-door neighbour of the City Company a year ago proposed to make an incursion into the sacred limits, with a view to furnishing the private consumers with a cheaper supply; and though the attack was warded off for the time, the City of London Company were fain to drop their price 1d. per unit. Now another rival has threatened to enter the field. The new-comers offer to serve the City at 5d. per unit, reducible on a sliding-scale to 4d. and even to 2d. Moreover, the supply would be on the low-pressure continuous-current system, which is the only one capable of supplying the needs of customers for power. The City of London Company use the alternating system. As a proposal has been made for the purchase of the City of London

Company's undertaking by the Corporation, the Charing Cross Company declare that the public interest would be better served by letting them in than by the Corporation buying the other Company out.

Here is a pretty tangle for the Board of Trade to unravel. There can be no question that the Charing Cross Company know what they are about, and can do what they promise as regards supplying cheap electricity. They are much under-capitalized as compared with the City undertaking; and they stand upon a better commercial footing. Of course if the new comers are to keep clear of the public lighting, they will have a further advantage over the City Company. On the other hand, the Charing Cross concern is a much smaller affair, and could hardly grapple with the City connection without reconstruction. If they persevere in their onslaught and ever succeed in entering the City, the whole question of competition in electricity supply will enter upon a new phase. Applications for concurrent electric lighting powers will be the order of the day; and Municipalities who fondly imagined themselves to be possessed of a monopoly of electricity supply may find they have been mistaken. Our contemporary the "Electrical Review" has devoted an article to the textual criticism of the important sentence which forms the close of section 1 of the Electric Lighting Act, 1888. In this way it is easy to make nonsense of the clause. It cannot be gainsaid, however, that the natural meaning of the clause has always been taken to be that the existence of one Provisional Order for an electric lighting area is not to be any bar to the grant of a second. Our contemporary, curiously enough, attaches a capital importance to the circumstance that wherever concurrent powers of supply exist, they have been granted at the same time. It seems to argue that while this is all right and proper, the grant of concurrent powers to an undertaking for a district in which another is actually doing business would be all wrong. There is not the smallest justification for so limiting the terms of the Act. There is no time-limit in question.

Certain local authorities having electric lighting undertakings are feeling uneasy in face of the new order of competition with which they are threatened—the competition of electricity generated in bulk at the coalfields, and distributed according to the famous Niagara power scheme. The full truth of the working results of this great experiment has not yet been told; but it is stated with reference to a similar water-power scheme—that of the Lachine Rapids—that power taken only for six hours a day can be supplied at a profit at the amazingly low price of less than 0·2d. per unit. There is no such water power in this country; but correcting the information from this establishment for coal generation at a cheap source, our contemporary the "Electrician" brings it out that the cost of the wholesale supply of electrical energy in England should not exceed 0·3d. per unit at the sub-stations. From these stations the energy could be retailed at less than 1d. per unit. This is a very important statement, which is calculated to arouse interest and attract criticism from a good many quarters. It is hardly too much to say that an unlimited supply of electricity at 1d. per unit delivered would have a great many more effects upon the industrial conditions actually prevailing in this country than that of merely reducing to "scrap" the generating machinery of many a municipal electric light undertaking. There is no great comfort in saying that such a consummation is not yet in sight. If the thing is possible, it will come. Then—— ? Well, perhaps it will be better to contemplate the idea for awhile before discussing its probable consequences.

THE ACETYLENE EXHIBITS AT THE IMPERIAL INSTITUTE.

So little does the casual visitor to the Imperial Institute discriminate between means of illumination—provided they are reasonably efficient—that it is seldom the lighting of the Intermediate Ground Floor Gallery by acetylene attracts the special attention of those who chance to wander through it. Where everything is an exhibit, the least obtrusive, though perchance the most interesting and valuable, escapes notice. In the gallery referred to, the magnificent grain and polish of a rare—but to him impossible—cabinet wood, creates a strong impression on a man's senses; while superb ostrich feathers distract the attention of every woman. The unobtrusive gas-pendants are passed unobserved, or at the most a word of admiration is bestowed on their chaste design in wrought iron and copper. The lights themselves do not attract the notice of the passer by, unless it happens that the placards at the entrances to the gallery have drawn his attention to them. So far as the general public are concerned, the illumination might equally well have been effected by means of coal gas or electricity. Perhaps no better testimony to the general efficiency of the lighting of the gallery by acetylene could be offered than the fact that the method of illumination escapes general notice. Even in the annexe to the North Gallery, where a number of works of art are displayed in the glare of numerous acetylene flames, and notices at every hand proclaim the intention of the authorities to be the exhibition of the value of the new illuminant for showing shades of colour in their natural daylight tints, many visitors heed not the illuminant, but merely admire the pictures and deckings of the room. Only in the North Gallery itself is a very half-hearted interest shown by the more inquisitive in the generators exhibited. After a preliminary query of an attendant has divulged to the inquirer that the generators in some mysterious manner are capable of furnishing an illuminating agent, doubts as to whether they are not a new form of plant for electric lighting have to be dispelled. Then follows the wearisome explanation as to the merits of acetylene and the partial truths as to its immense superiority to coal gas. To do the visitor justice, he is only a trifle less ignorant of acetylene than some of the stall attendants; but the latter have the advantage of a few weeks' acquaintance with the pamphlet literature with which the makers of generators have freely supplied them.

Nearly every maker of apparatus who is exhibiting at the Imperial Institute appears to have considered it necessary to give some account of the commercial production and properties of calcium carbide and acetylene; and many of the pamphlets and price lists are curious reading. Acetylene is almost universally credited with a practical illuminating power of 240 or 250 candles; and no hint is offered that burners which give it so high a duty are useless after a few hours' work. With regard to comparisons with coal gas, one might suppose that regenerative and incandescent burners did not exist; for makers of acetylene generators have generally found it convenient to ignore them. We should be doing acetylene no greater injustice than several exhibitors do coal gas, were we to state the illuminating power of coal gas at 30 candles per cubic foot, which is the duty afforded by the new Welsbach or the Bandsept burners, and that of acetylene at about the same number of candles per cubic foot, which is the duty the Naphey burner affords. Then if we proceeded to state the cost of coal gas at the by no means excessively low price of 2s. per 1000 cubic feet, and acetylene at the fair price of 40s. per 1000 cubic feet, we should be able to declare that coal gas afforded the same amount of light as acetylene at one-twentieth the cost. The statement would be at least as justifiable and irrefutable as many of those now being promulgated by unscrupulous exhibitors at the Imperial Institute. We will just quote *verbatim* one specimen of the confusing "literature" which the vendors of acetylene generators think good enough to offer to prospective purchasers: "Our Generator is much easier to manipulate than any electrical apparatus or oil-lamps, and much cheaper, as there are no broken glasses nor falling of mantles as with Incandescent, the light also being far superior and much cheaper." Probably the electricians and oil dealers will smile at the reflections apparently cast on incandescent electric and oil lamps in this precious sentence; but we doubt if they will so readily admit the superiority and cheapness of acetylene lighting. Well may those who have the welfare of the acetylene industry at heart pray that it may be saved from its friends.

The Acetylene Illuminating Company, Limited, who manufacture at Foyers the whole of the carbide of calcium used at the exhibition, state the case for acetylene very fairly and plainly; and several exhibitors might advantageously adopt the moderation of tone and caution in asseveration which mark the pamphlet issued by the Company which has by far the largest stake in the acetylene industry in Great Britain. The attitude of this Company is indeed that which the "JOURNAL" has consistently adopted towards acetylene; and we cannot do better than endorse the penultimate sentence of the pamphlet, which runs as follows: "The Acetylene Illuminating Company are satisfied that, by continuing to work with caution in the development of this new industry, avoiding any exaggerated claims, the interests of apparatus makers, of the Acetylene Company, as manufacturers of carbide, as well as of the public, will be the best served." The advice is sound; but so far few makers of apparatus seem to have followed it, for "exaggerated claims" are rampant in nearly all their catalogues.

The exhibition must be deemed to have achieved the main object of its being, in that it has shown, as we have already indicated, that a building may be efficiently lighted by acetylene without accident. It has also proved that a number of generators are on the market, which, if they do not embody all desirable points, at least are capable of performing their work without serious hitch or trouble. The better purification of the gas, and the improvement of the burners, at present appear more urgently to demand attention than does the mere generation. From the flames rise nebulous wreaths, which are not wholly due to the upcurrent of heated air or gaseous products of combustion. This phenomenon pervades nearly all the acetylene flames in the building, and appears to be greatly accentuated in draughty positions. In the comparatively lofty gallery of the exhibition, no inconvenience arises from the products of combustion; but in an ordinary dwelling-room they would almost certainly prove objectionable. It should, moreover, be remembered that all the acetylene burnt at the Imperial Institute is made from the relatively pure carbide produced at Foyers; and a less carefully prepared material would yield acetylene which would give more obnoxious products. On the other hand, the Acetylene Illuminating Company claim to have the right to control the importation and manufacture of carbide in this country, and threaten to exercise it; so it may be that, for a time at least, only the Foyers carbide will reach the consumer. We understand, however, that the Company will be vigorously opposed by several importers and manufacturers of carbide, if any attempt is made to suppress their traffic in the article.

The method of classification of the generators adopted by the Exhibition Committee has already been stated in the "JOURNAL."* Automatic generators far outnumber those of the non-automatic pattern; and the drip type of apparatus is more prevalent than the dip type, or that in which carbide is made to fall into water. This is not surprising, seeing that it more readily adapts itself to automatic control within certain limits. Few of the generators exhibited are provided with purifying chambers. The idea that cooling and drying the gas constitute sufficient purification continues to prevail, notwithstanding the weight of expert opinion to the contrary. In some few instances, mysterious chemicals are used, and are alleged to possess uncommon virtues as purifying agents. Our remarks on p. 1375 of the last volume of the "JOURNAL" may be profitably taken to heart by all to whom these mystic materials are offered.

(To be continued.)

ANOTHER VIEW OF THE PHILADELPHIA GAS-WORKS LEASE.

THE article by Professor Bemis in the March number of "The Forum," upon the lease of the Philadelphia Gas-Works is a striking testimony to the interest that is being taken by American publicists in this transaction. The writer begins by reminding his readers of the recent Convention of American Mayors, at Columbus, Ohio, when the principle of municipal ownership for electric lighting and gas undertakings was discussed at great length, and accepted as agreeing with public opinion. This convention was mentioned in the "JOURNAL" for Dec. 31, 1897. Again, there was a Convention of the American Federation of Labour, at which a resolution was passed in favour of the substitution of municipal ownership for private property "in all public utilities that are in the nature of monopolies." The discrepancy between these theoretical pronouncements and the practical dealing of the City of Philadelphia with the local gas supply is so glaring that Professor Bemis feels called upon to pass the facts in review. He agrees with Dr. Rowe, whose work has recently been noticed, that the works were inefficiently managed by the City; and that the lease offers considerable benefits to the community for the next few years. But, also in agreement with Dr. Rowe, he contends that the people of Philadelphia were awakening to a sense of the need for better management of this property. If they had been left alone, the people would have supported any feasible scheme for the improvement of the works; but the Councils of the City had their own views as to the necessities of the case. Having voted down a proposal to submit the question of a lease to popular vote, which, it was generally believed, would have been overwhelmingly adverse to the lease, this same governing body accepted what Professor Bemis characterizes as "clearly far from the best lease that was offered." His deliberate opinion of the transaction is therefore that the lease is not to be taken as "evidence of the deliberate turning of the 'City against city' ownership of a great monopoly—which it was not—but as a striking lesson of the benumbing effects on public ownership of its mixture with private ownership, as has been true for ten years; and a lesson, further, of the difficulties that city ownership must face in this country by reason of the 'spoils' system, and the readiness of the masses to follow those party bosses and 'leading citizens' who fatten on the demoralizing relations between weak or corrupt governments and immensely valuable franchises when in private hands."

The financial condition of the Philadelphia gas undertaking, according to the published report for 1896, is given by Professor Bemis as showing a corrected surplus of about $150,000 on the year's operations. This, however, would have been turned into a deficit of about $200,000, if the City, instead of buying 40 per cent. of its gas in bulk at the price of 37 c. per 1000 cubic feet, had itself made the whole at the exorbitant cost of 55 c. per 1000 cubic feet, at which it manufactured 60 per cent. of the supply. Professor Bemis recounts the heads of the lease, which we have already given from Dr. Rowe; dismissing as "impracticable" the provision for resumption of city control at the end of ten years.

The lighting power of the gas is to be improved to 22 candles; but it is supposed to have been nearly of this quality before. With regard to the appalling percentage of leakage reported, Professor Bemis declines to believe that the admittedly high proportion of unaccounted-for gas is actually wasted in this way. He believes there is no such leakage, but rather that a large number of consumers' meters have become worthless from old age and want of proper attention. If so, the lessees are probably in for a rich crop of complaints whenever they put the meters in a proper state.

According to Professor Bemis, the gas-works were handicapped while under city control, partly by unbusinesslike methods of purchasing supplies, but chiefly by the failure of the Councils to improve the works as public need demanded, and by the influence of the "spoils" system in local politics. Notwithstanding these disadvantages, it is argued that the majority of the citizens, and the great reform organizations of the city, decidedly preferred the continuance of public ownership and operation of the undertaking for the following specific reasons: Under such ownership, corrupt and inefficient as was the administration, the price of gas had been lowered during the previous twenty-one years at a much faster rate than it can decline, under the new lease, during the next thirty years. It was believed that gas could have been made at the city works for 40 c. per 1000 cubic feet, under a reformed administration. Gas in Philadelphia, under public ownership, has always been cheaper than gas in New York under private ownership, except at certain times and under conditions which Professor Bemis explains. It was generally believed that the unwillingness of the Councils to improve the works was due to their desire to play into the hands of the United Gas Improvement Company, which was yearly selling more gas to the Municipality in bulk. In brief, this Company and their associates are described as owning the city; so that resistance to their designs upon the gas undertaking was felt to be futile.

Professor Bemis devotes a considerable portion of his article to showing that elsewhere in the United States the public ownership of gas undertakings succeeds, notwithstanding the curse of politics and corporation incompetence in business matters. The instances cited, however, are not numerous; nor, with the single exception of Richmond, Virginia, are the towns large. It is admitted by Professor Bemis that these public undertakings make gas at exorbitant cost; but he argues that this really does not matter to the public, because though the manufacturing expenses of gas companies might be less, they would certainly charge more for the gas. Cheap gas, according to this not very reassuring view, is not out of the reach of the American people. The only hope of improvement in this respect—and it is a thin one—entertained by Professor Bemis is expressed in the sentence: "There is no reason why American cities should not have equal success in public ownership of lighting plants with that existing across the water, as soon as our people are anxious to have such success." The city administrations are corrupt; the leaders are self-seeking; and the people are content to have it so. The picture is not a pleasing one; but it is at least candid.

GASHOLDERS ON PEASE'S SYSTEM.

AN illustrated and annotated catalogue of gasholders erected by Messrs. Ashmore, Benson, Pease, and Co., Limited, on Pease's wire-rope system of guiding, deserves fuller notice than the ordinary run of trade publications. Though the idea of the possibility of improving on the old style of external lofty guide framing for gasholders was first suggested in the "JOURNAL," it is due to Mr. Pease to state that the credit of devising and working out what has proved to be the most elastic method of controlling gasholders without guide-framing belongs to him and to his firm alone. The extent of development of this system is exhibited by the fact that the present catalogue deals in consecutive order with: (1) Three-lift cable guided gasholders; (2) telescopic gasholders enlarged by the addition of two lifts; (3) single-lift gasholders enlarged by the addition of two lifts; (4) two-lift cable guided gasholders; (5) single-lift gasholders enlarged by the addition of one lift; (6) telescopic gasholders enlarged by the addition of one lift; (7) single-lift gasholders enlarged by the addition of one lift, the columns being retained; (8) single-lift gasholders in steel tanks; (9) single-lift gasholders. This list appears to cover the whole range of modern gasholder practice; and when the examples collected in this catalogue are glanced at, their number and importance are ample evidence as to the practical value of the cable system. The enlarging of gasholders by the addition of extra lifts has of late years been a most important branch of gasholder construction; and it is claimed that the cable system of control is especially suitable for use in this economical method of increasing gas storage capacity.

The catalogue is prefaced with a brief explanation as to the principles of gasholder guiding. It is shown that all that is necessary in this regard is to secure parallel vertical movement of the gasholder; and this can be perfectly effected by cables. When the system was first introduced, there was no available knowledge as to the actual amount of work performed by the guiding arrangements of a gasholder. It has been ascertained that the strength required to preserve the rectitude of movement and position of gasholders under all the conditions of service, is much less than was once supposed to be necessary. The application of cables for supplying this strength furnished, for the first time, a means of ascertaining the overturning forces acting upon gasholders; and it was found that the strain upon the cables is well within the strength of steel rope in common use. "There is, in fact, a very large margin of safety allowed in every holder designed on these lines, without using cables of greater diameter than from $\frac{5}{8}$ inch to $\frac{7}{8}$ inch." In the later examples, the controlling power of each cable is increased on the principle of moveable pulley blocks. This is termed the multiple-power system. The ability to increase the effectiveness of the cables in this way is a great convenience in designing telescopic gasholders. For example, the inner lift may be guided by a series of cables in single purchase; and the same cables when continued to the second lift may be used in double purchase. Or

* See Vol. LXXI. p. 953.

the two inner lifts may be controlled by single purchase, and the third lift on the treble purchase principle; thus securing the greatest strength where it is most required.

The cables employed are of high quality steel, either galvanized or built up with a waterproofing solution. The attention they require in operation is only a small fraction of the labour and cost entailed in painting columns or standards. An ingenious device of a floating cup of wood, through which the cable passes on entering the tank, protects and automatically oils it. It is stated that the earliest cable-guided holder, erected in 1889, still has the same cables in excellent condition. In ordinary positions, a cable will last well for an almost indefinite period. In some places, the atmosphere or the water tends to deteriorate the metal, which has to be guarded against.

The first example in the catalogue is the Middlesbrough three-lift gasholder, which is 184 feet in diameter, in 30 feet lifts. "Owing to the treacherous nature of the foundations, the tank has sunk in so irregular a manner, that it is certain had any other method been adopted than the cable system, the holder would have been an absolute failure. . . . The holder works perfectly level, although the tank is as much as 7½ inches out of level." In contrast with the Middlesbrough holder is that at Sligo, which is an old single-lift of 50 feet diameter converted into a three-lift; the columns being removed. It is safe to say that such an enlargement would have been impracticable with column guiding. The holder now rises higher than its diameter. It is fully exposed to the Atlantic gales; and it is interesting to note that a registering device applied to the holder showed in a storm a strain on the cables of 8 cwt. only.

It is unnecessary to multiply references. Not the smallest incidental advantage of the cable system consists in the help it affords for cheap tank construction. In a large number of cases a steel tank on the ground level can now be provided at a considerable saving on a tank for which extensive excavation is required, besides being absolutely tight. Where the cable system is adopted, a small bracket takes the place of the length of guide standard which would otherwise stand beside the tank.

OBITUARY.

Mr. T. G. Browning, the Secretary and Manager of the Whitstable Gas and Water Companies, has recently died at the age of 69 years.

Mr. D. Grant, late of the firm of Messrs. David Grant and Co., gas-meter manufacturers, of Edinburgh, died at his residence in that city on the 6th inst., in his 88th year.

We regret to learn of the death, on Sunday, the 10th inst., of Mr. W. H. Catlin, the Manager of the Kilkenny Gas-Works, under circumstances which leave no doubt that the unfortunate man committed suicide. Deceased was a Freemason, and held an official position in the local lodge.

PERSONAL.

Sir John Wolfe-Barry, K.C.B., F.R.S., has been elected Chairman of the Council of the Society of Arts.

M. Moissan has been awarded the grand prize of 12,000 frs. by the French Société d'Encouragement pour l'Industrie Nationale, for his numerous researches in chemistry.

We are asked to state that Mr. L. de Fonblanque and Mr. Julius Moeller have resigned their seats on the Board of the Frank Wright Prepayment Gas-Meter Corporation, Limited.

Mr. T. Whimster has been appointed Manager and Secretary of the Omagh Gas Company, in succession to the late Mr. D. M'Callum, to whom he was assistant. Mr. Whimster is the eldest son of the esteemed Secretary of the North of Ireland Association; and he became associated with Mr. M'Callum rather more than two years ago, on completing his articles with Messrs. R. Laidlaw and Son, of Glasgow.

We learn from the "American Gaslight Journal" that Mr. Forrest E. Barker, the Chairman of the Massachusetts Board of Gas and Electric Light Commissioners, has been re-appointed by the Governor of the State. Mr. Barker has served longer than any other member, having been continuously a Commissioner since the establishment of the Board in 1886. He is a lawyer by profession; but, by contact with engineers both in America and in other countries, he has acquired an intimate knowledge of the gas business in all its details, and it may be fairly said, without injustice to the other members of the Commission, that much of the success of the Board has been due to his tact and good judgment. That the work of the Board is approved, is shown by the fact that the Legislature, before its recent adjournment, departed from its established precedent, and resolved to increase the salaries of the Commissioners from $2500 to $3500; raising that of the Chairman from $3000 to $4000 per annum.

Mr. John Gilbert Taplay, of The Gaslight and Coke Company, has been appointed Lecturer on "Gas Manufacture" at the Battersea Polytechnic, and will commence his duties in October next. After finishing his education at the Newcastle (Staffs.) Grammar School, Mr. Taplay commenced his career in the gas profession as pupil of the late Mr. Robert Linging, Engineer of the Potteries station of the British Gaslight Company. Soon after that gentleman's death, Mr. Taplay was appointed Assistant to his father, who was then Engineer and Manager of the Stoke-upon-Trent Corporation Gas-Works, and remained with him till the change of management took place under circumstances which were reported in the "Journal" at the time. In the list of successful candidates in the examinations in "Gas Manufacture," which we published on July 25, 1893, Mr. Taplay was among the few who passed first class with honours. The promise then given of a useful career is being fulfilled; and we cordially wish him continued success.

Lighthouse Illumination by Incandescent Gas-Burners.—A Committee of the Elder Brethren of the Trinity House (Captains Vyvyan and Slader) lately visited Yarmouth to inaugurate what may prove to be a most important improvement in coast illumination by the adoption of the incandescent gas-burner at the Caister leading lights, on the Britannia Pier, and at the Sailors' Home. The Committee and Superintendent left Yarmouth by boat, and proceeded as far as the Cockle Light Vessel to view the lights, which were a marked improvement on the old ones, showing clear and distinctly superior to the electric lights by which they were surrounded, and presenting to the mariner an increase of illuminating power from 3000 to 10,000 candles.

Bartlett's Incandescent Burner Adapter.—An ingenious arrangement for automatically controlling gas-lighting burners has recently been patented by Mr. F. G. Bartlett, of 4, Elton Road, Bristol. Some particulars as to the invention appeared in the "Journal" for Jan. 4 last (p. 27) and May 31 (p. 1263). The apparatus is made in the form of an adapter, and is primarily designed for use with incandescent burners. It has not hitherto been possible to control from a distance, with certainty, one or a series of burners without a separate pilot-service, or bringing into requisition a more or less lengthy rod with which the lever and chain can be operated. It is recognized by gas engineers that a "missing link" is required to render perfect an installation of incandescent burners in large halls, places of worship, &c. Although attempts to deal with the difficulty have been numerous, we do not think any method so practical and effective as that here referred to has yet been discovered.

Wynn's Automatic Waste-Preventer for Gas-Stoves.—Ready as are housewives to acknowledge the advantages of cooking by gas, they not unfrequently complain, as many gas managers are aware, of heavy bills, caused by the wasteful use of the gas by their domestics. As this tendency is one which it has been found very difficult to check, various appliances have been devised for automatically shutting off the gas as soon as it is no longer required. The latest of these is a cooking-stove attachment patented by Mr. J. Wynn, of Cardiff, by the use of which, it is claimed, waste is rendered impossible. A lever with a small roller is fixed just above the bars of the hot-plate, and is fastened to a rod which runs immediately below the bars to the tap. At the other side of the hot-plate is fixed a balance-weight. As the servant puts the kettle or other vessel on the ring burner of the hot-plate, the lever turns on the gas. A part of the patent is an improved gas-tap which is constructed to work in conjunction with the automatic action, which enables the cook to perform the various culinary operations and produce any gradation of heat required without lifting the vessel from the burner. When the vessel is removed entirely, the balance-weight attached to the lever shuts off the gas. Fixed to the side of each burner, in such a position as to be quite out of the way, is a small pilot-light; thus rendering unnecessary the use of matches and spills, which, as is well known, is the cause of an accumulation of dirt. Messrs. John Wright and Co., Limited, are licensed manufacturers of the attachment for Great Britain and the Colonies.

The Inspection of Steam-Boilers.—We have received from the Chief Engineer of the Manchester Steam Users' Association (Mr. C. E. Stromeyer) a print of the memorandum presented by him at the annual meeting on the 5th of April, which has just been issued as a pamphlet. The "Advice to Boiler Attendants" which was distributed early in the year, and noticed in the "Journal" for Feb. 22, is reprinted; and a few practical remarks on the best method of cleaning boilers and economizers have been added, as well as somewhat fuller explanations on the injury caused to boilers by incrustation and grease. An appeal is made to steam users to spare their boilers by using less oil in the cylinders. The memorandum also contains a short review of the life of the late Chief Engineer, Mr. Lavington E. Fletcher. Further, a few interesting comparisons are given as to the cost of explosions of boilers other than those approved of by the Association, which was the first institution to establish periodical boiler inspection on a practical basis. The Association record with justifiable pride the fact that they have had only one explosion among the 6000 boilers entrusted to their care. It is pointed out that out of 215 persons killed or injured during the last five years, the large proportion of about one in thirteen were boiler owners or their sons or managers; and steam users are urged, for their own personal safety, to insist on having their boilers properly inspected. The memorandum also refers to the average cost of explosions distributed over the entire number of boilers in the United Kingdom; the calculation being made in view of the increased liabilities imposed upon factory owners by the Workmen's Compensation Act.

NOTES.

Testing the Permeability of Paints.

A quick method of testing the permeability of paint by water and gases is proposed by H. Loesner. Small strips of sheet iron, of uniform size, are carefully brightened on one side by rubbing with emery or glass paper and immediately coated with a thin layer of the paint under examination. Four days later another coating is applied, and the slips are allowed to dry for four days longer. They are then laid, paint downwards, over a constant-level water-bath, being supported at a height of 50 mm. above the surface of the boiling water. After fifteen hours' exposure to the ascending steam, the paint is dried at a maximum temperature of 100° C. It is then removed by the aid of aniline and a soft brush, when the surface of the metal should be found free from rust, if the paint is good. The effect of acid vapours may be tested in the same way, except that concentrated (33 per cent.) hydrochloric acid is substituted for the water, and the protective incrustation formed on the surface of the paint is to be rinsed off every hour, the temperature being 20° C., and the time of exposure twelve hours. A good idea of the comparative protecting value of paints and other rust-preventing applications for ironwork may be obtained in this way. Substances sold by the same name are found to differ widely in this quality. Good paint should stand the treatment for a minimum of twelve hours.

Lighting by Vacuum Tubes.

A novel scheme of interior lighting was shown at the New York Electrical Exhibition by Mr. D. M. F. Moore, whose work in connection with the development of light from vacuum tubes has been more than once mentioned in the "JOURNAL." According to the "Electrical Engineer," Mr. Moore erected in the Exhibition a model chapel, complete in every detail, in which he shows to perfection the manner in which vacuum tube lighting might be carried into practice. The vaulted roof is ribbed with veritable arches of light emanating from long curved glass tubes about 2 inches in diameter, glowing their entire length with a pure white effulgence. Hence the lighting comes from the soffit of the roof arches. It is evident from the account that a good deal of accessory apparatus is required to produce this result from the ordinary street electric lighting service. According to Mr. Moore, his system at its present stage of development is of about equal efficiency with incandescent electric lighting; but he looks for better results with improvement of the tubes. It is stated as one of the recommendations of this system of lighting that it is possible to vary the colour of the light, even to the most delicate shades, by simply changing the degree of vacuum of the tubes; thus making them the ideal source of light for every decorative purpose. In the absence of detailed statements of cost, however, it is impossible to say whether any real progress has been made with this system, which it is hardly necessary to say is upon a very old principle.

The Commercial Testing of Iron and Steel.

Mr. Kreuzpointner recently read a paper before the Franklin Institute on the practical aspect of the present customary commercial methods of testing structural iron and steel. He points out that the subject of testing structural materials must tend to assume greater importance as time goes on, and nations discover the necessity of using higher economy in the consumption of their material resources. With regard to iron and steel, the tensile test appears to be considered the most important, and is therefore the most widely used. Seeing that the bending or nicking test of a whole bar of metal shows its internal make-up as well as, and often better than, the tensile test of a strip cut from the same bar, it is averred that at present much time and money are spent in the tensile testing of ordinary iron where a nicking testing would be better. The latter, however, makes greater demands upon the knowledge and judgment of the operator. The author criticizes the ordinary tests for elasticity and contraction of area under tension. He declares that while for special grades of steel in short pieces the test for reduction of area has some practical value, it is different with the enormous masses of structural material of all kinds now produced and sold for every-day use. The drop-test is a very practical method of ascertaining the shock-resisting power of the metal, provided the blows are sufficiently heavy. Mr. Kreuzpointner appears to rely above all, however, on nicking and bending tests. "If iron, a nicking test will show whether it is clean or dirty, short-fibred or long-fibred, dry or juicy, coarse crystalline due to cold shortness, or that fine, mushy, silvery granulation so characteristic of burnt iron. In steel, the nicking will show laminations, shortness, and to a certain extent want of uniformity of heating of the material in the mill." The bending test is a reliable measure of ductibility; for if the convex surface has a velvety appearance, without showing the smallest skin cracks, it is fair to conclude that the piece of steel is of good quality.

"Carbolite"—A Rival of Calcium Carbide.

According to a statement appearing in "The Iron Age," a competitor with calcium carbide as the source of an illuminating gas has been found in a product named "carbolite," into which blast-furnace slag enters as the chief constituent. Mr. Herman L. Hartenstein, of Chicago, is the patentee of a process for utilizing blast-furnace slag in the manufacture of a new product from which ethylene gas is producible, like acetylene from calcium carbide. "Carbolite" is described as a combination of calcium carbide, aluminium, and silicon. It is produced by the following method: Blast-furnace slag is placed while still fluid into converters similar to those used in making Bessemer steel. The tuyeres of these converters are so arranged that finely-powdered coke can be fed through them with the air-blast. By this means the slag is stated to be thoroughly impregnated with the coke. What follows is somewhat mystifying. It is said that when the mixture of the coke dust with the slag is complete, the converter is turned over so as to allow its contents to flow between a series of carbon bars forming electrodes, through which a powerful electric current passes. "Coke is an excellent conductor of electricity, while slag is a resistant. The result is that the particles of slag in connection with the particles of coke form innumerable electric arcs, producing a most intense heat within the mixture. In the course of about twenty minutes, the mass becomes so superheated that slag is fused or carburetted with the coke. When this fusion is effected, the material is finished. It is then poured into moulds." This is the carbolite, which when cooled has a crystalline nature, with a metallic lustre, and can be kept so long as it is protected from air and moisture. It is to be used for generating ethylene, like calcium carbide for acetylene. The yield of gas is 5 cubic feet per pound. Preparations are being made at Hammond, near South Chicago, for the production of the carbolite by the adaptation for the purpose of a disused Bessemer steel plant.

The Theoretical Aspects of Acetylene Manufacture.

An article in the "Engineer" discusses the theoretical aspects of acetylene manufacture. It is admitted that until such time as the price of calcium carbide shall be so far reduced that the cost of acetylene lighting is very greatly below that of intelligently burnt coal gas as delivered to consumers in cities—a consummation more to be desired than expected—there is little prospect of the former being adopted by individual urban householders. With reference to the protective office of the odour of the illuminating gases, coal gas and acetylene, it is remarked that "the nose becomes habituated to the smell of coal-gas after a time—fatigued or paralyzed, perhaps—since country people usually affirm that they can detect gas in every town house, just as citizens notice the odour of paraffin in every country village." It is questioned whether fatigue of the nose would occur so soon with acetylene; "for the latter generally causes a distinct headache as well as a sensation of disgust." With regard to the preparation of acetylene from calcium carbide for domestic lighting, it is advised that some sort of purifying arrangement should always be used. Without going deeply into the details of the acetylene generators now being offered to the public, and many of which are described as "automatic," it is observed that the only safe principle to work upon is that of controlling the supply of carbide to the water. "The ordinary plan for governing the make of gas is to admit the second ingredient of the active mixture through a valve worked by the rise and fall of the holder bell;" and as it is obviously easier to treat a liquid in this fashion than a solid, this is the reason why so many generators admit the water to the carbide. This principle is only suited to the smallest-sized apparatus, designed to consume but a few pounds of carbide. It is suggested also that every generator, automatic or not, should be provided with a holder capable of containing 50 per cent. more gas than can be evolved from the weights of the active substances ever brought together at one time.

Uniform Methods of Conducting and Reporting Engine Tests.—At the recent meeting of the American Society of Mechanical Engineers, Mr. Bryan Donkin read a paper on the advisability of extending standard uniform methods of conducting and reporting steam-engine tests. He recognized the valuable work done in the United States, and expressed the opinion that more uniformity could be obtained in the future by the adoption of standard methods and more combined action. The above-named Society have formulated instructions to be used for testing not only steam-boilers, but locomotive and water-pumping engines; and Mr. Donkin suggests that similar standard methods of conducting and reporting experiments should be extended to the important branch of marine steam-engines, and also to factory, mill, and agricultural engines and quick-running steam-motors for electrical work. He thinks a Committee of the Society might be appointed to take these questions into consideration, and to standardize a uniform method of testing and reporting on gas and oil engines. As these extremely economical motors give a very much higher heat efficiency than steam-engines, they must have a great future before them. Consequently, Mr. Donkin thinks the sooner such methods of trial are published, the better it will be both for those who make the tests and those who have to compare them. He suggests the use of blank forms and separate instructions, printed on strong paper, in pocket-book size, for the different types of engines. These should be purchasable at a moderate price; and they might be translated into French and German and adapted to the metric system. This matter has been taken up, at Mr. Donkin's suggestion, by the Council of the Institution of Civil Engineers, whose Thermal Efficiencies Committee, of which he is a member, have issued a preliminary report in which they recommend that all steam and heat engine results should be given in thermal units per indicated and brake horse power.

COMMUNICATED ARTICLES.

THE WORK OF THE PURIFIERS AND PURIFYING MATERIAL.

By STEPHEN CARPENTER, of East Ham.

At the close of the preceding article,* I referred to some unusual results attending purification by lime which were made the subject of special investigation. The first thing I did was to prevent atmospheric air from passing into the purifiers from any source whatever. After doing this for several days, the sulphur would be low—about 12 to 15 grains per 100 cubic feet of gas; then for a few days it would be very high, and afterwards for a few days low. Sometimes it would be as high as 50 or 70 grains per 100 feet. When the sulphur was low I had the cover of the purifier lifted, so as to examine the condition of the lime in the purifier. It was found to be very hot, and of a dark green colour. At the same time I was not satisfied with the working of the oxide of iron purifiers; and when the sulphur was again high, the cover was once more lifted, when the lime was found to be white instead of dark green, and there was but little heat in it. When the air was passed direct into the oxide purifiers, they went very well, and continued working much longer before changing. When the air was passed direct into the lime purifiers, the oxygen of the air was used up before it reached the oxide purifiers. By preventing the air from passing into the lime purifiers, and sending it direct into those containing oxide, both kinds worked well.

After the atmospheric air was excluded from the lime purifiers, there were at times fluctuations in the sulphur which gave rise to much trouble. By passing the air direct into the oxide of iron purifiers, it caused the oxide to work well, and last months instead of weeks before changing; but the fluctuations in the lime purifiers entailed much trouble at times, and their cause had to be discovered, so as to bring the lime under such control as to enable it to take out of the gas a part of the bisulphide of carbon. In order to find these fluctuations, the writer thoroughly examined all the apparatus where there was vacuum on; and, to his great surprise, he found a serious leak in the condensers where the air was passing in. He had the leak stopped; but this did not prevent all the fluctuations in the sulphur. He took the temperature of the gas at the inlet of the first lime purifier, and found it very high; he also took it at the inlet and outlet of the condensers, and it was also very high. Knowing there was something wrong, he examined the retorts, and found several small and large holes—some on the bottom, and some on the crown of the retorts. He had all these stopped, and kept a good look-out for them in the future. By preventing air from any source from passing into the lime purifiers, seeing that the retorts are well mended, and not keeping the purifiers too long in action, all anxiety as regards high sulphur in the gas will be at an end, and there will be no trouble with the lime purifiers.

The foregoing has been written especially for gas students or young gas managers, with the view of showing the trouble the writer had when he first commenced experimenting with lime for the removal of the carbonic acid and part of the bisulphide of carbon from the gas. He has pointed out these discrepancies so that managers may know where to look for them if ever they are troubled in this way. If the gas is treated in the manner here described, it will be purified in the best way at present known; and it will be as pure as it can be made. The following are the impurities which require to be removed: Ammonia (NH_3), carbonic acid (CO_2), sulphuretted hydrogen (SH_2), and as much of the bisulphide of carbon (CS_2) as is possible. The gas will then be as pure as it can be made at the present time.

The efficient purification of coal gas depends upon the employment of means for arresting the ammonia in the first instance. It has been said that the power of hydrate of lime is greater when the gas contains ammonia than when the ammonia is previously removed; also that the ammonia increases the chemical action of the lime. The writer has not found it to be so in practice. His experience has been that the hydrate of lime never becomes perfectly saturated or neutralized by the carbonic acid and sulphuretted hydrogen of the gas; but that, on the contrary, a large amount of the lime employed remains in a caustic state. This, in a great measure, is owing to the fact that, the lime being in the form of nodules, the centres of these cannot be brought into contact with the gas without at the same time exposing the outer surfaces of the sulphide of calcium to the action of the carbonic acid of the gas, whereby, of course, decomposition would be induced, and the sulphuretted hydrogen driven from one purifier into another. In order to avoid this, sacrifice of lime is needed; and the only point requiring attention is to see that this sacrifice is not carried too far. As soon as the lime in the first purifier shows that the bisulphide of carbon is as high as it is in the crude gas, the purifier must be thrown out of action. The spent lime should be ventilated or deodorized before it is taken from the purifier; and when it is removed it should be well spread out, and have some water thrown upon it if needed. Turning it over will break open the nodules, and bring them into action; and then the lime can be used for a second time. If it is manipulated in the way here described, the expense of purifying the gas will be much reduced. The writer is inclined to think that the process of purification by lime has not hitherto been fully appreciated, or worked as it deserved. After the lime has been used the second time and revivified, it becomes carbonate and sulphuret of lime, which is a good manure for heavy land; so that after the lime is spent it can be turned to profitable account.

It is indispensable to bear in mind the exact composition of foul lime before it is ventilated or revivified. Foul lime as it is removed from the purifier consists of an admixture of several salts. The ferrocyanate, sulphocyanate, and hydrocyanate of lime are in such minute quantities as not to require notice here. But there are others, such as the carbonate and the hydrosulphate of lime; and if the ammonia has not been taken out of the gas, there will be hydrosulphate of ammonia. If the foul lime has not been revivified, it is not surprising that, with such a mixture of impurities, an offensive odour should be emitted on exposure to the air; but if the simple process of ventilating the purifier and at the same time revivifying the foul lime has been gone through, there will not be any disagreeable smell when the lime is lifted from the purifier. After the lime has been used a second time, it should be revivified before it is taken from the purifier, and then there will not be any offensive odour.

As a great deal has been said about lime as an agent for the purification of coal gas, let us now notice the qualities of this material. It is well known that lime was the first agent employed for the above-named purpose; and recent experiments, conducted with the most scrupulous care and by some of the most experienced manipulators, have shown beyond all question that nothing is so well adapted as dry lime for the complete purification of gas from carbonic acid, bisulphide of carbon, and sulphuretted hydrogen, and nothing tends so much to preserve its illuminating power. Common lime, used in a dry-lime purifier, will purify the gas better than any other agent, if the atmospheric air is excluded from the purifiers. Hence the lime, when fully saturated, or, as it is called, "foul," contains none of the light-giving properties of the gas, for these have passed through untouched. A very different result is witnessed when oxide of iron or other agents employed. Oxide of iron only removes the sulphuretted hydrogen; leaving the carbonic acid and bisulphide of carbon. The reason is this: Bisulphide of carbon is termed a sulphur acid, while the hydrate of lime is alkaline in its nature, and therefore has a great affinity for an acid. This affinity exists between the hydrogenated sulphide of calcium and the bisulphide of carbon in the gas. A very different result, however, is experienced with oxide of iron, as this material is not of an alkaline, but rather of an acid nature; consequently, there is no affinity for either carbonic acid or bisulphide of carbon. It has been pointed out how much more energetic is the action of lime upon the impurities of coal gas than is that of any metallic salt or oxide whatever. Indeed, it has been shown that this superiority of lime is so decided, that no hesitation has been felt in declaring the complete purification of coal gas to be practically impossible without the free use of this material.

The chemical action of lime is somewhat as follows: When the crude gas is permitted to act on the hydrate of lime in the purifier, the heat of the gas dries up some of the moisture of the lime, and at the same time the temperature of the lime is raised. This prepares the lime for the absorption of the bisulphide of carbon. If the material in the purifier becomes damper instead of drier, the chemical action would be very slight. The writer has found in practice that when the lime has been in its best condition for taking out the impurity in question, it has been so hot as only just to allow of the hand being thrust into it. If it had not reached this temperature, it would have but little affinity for the bisulphide of carbon. If the crude gas is passed through wet lime, or what is called "cream of lime," the bisulphide of carbon will not be removed. The gas being made should be tested for this impurity twice in 24 hours, so as to keep the lime purifiers in good order. The gas taken from the outlets of the lime purifiers to be tested should be passed through a small purifier charged with about half-a-bushel of oxide of iron, in order to remove any sulphuretted hydrogen.

A little knowledge of chemistry is very useful in the manufacture of coal gas; and for the benefit of those young managers who have not had the advantage of instruction in this particular branch of science, the writer will offer a few simple observations on certain matters which he found helpful when he first began to study gas making. He does so in the hope that they may be of service to those for whom they are specially intended. The chemistry necessary in connection with the manufacture of coal gas relates mainly to testing the gas for its impurities. The raw material—coal—is composed of several ingredients, such as carbon, oxygen, hydrogen, nitrogen, sulphur, and iron. When the coal is put into a retort at a bright heat its normal condition is changed; and when its various ingredients are set at liberty, we get these products—coke, carburetted hydrogen, hydrogen, carbonic acid, sulphuretted hydrogen, ammonia, bisulphide of carbon, various basic hydrocarbons containing nitrogen, &c., protosulphuret of iron, tar, and water. After the volatile matter has been driven out of the coal, the excess of carbon remains as coke, which holds the protosulphuret of iron derived from the decomposition of the bisulphuret. These are the impurities. The hydrogen in part remains free, while part combines with the carbon, giving rise to various kinds of

* See "JOURNAL" for April 19 (p. 882).

hydrocarbons, such as gas, naphtha, and tar. Another portion of the hydrogen combines with part of the bisulphuret of iron and any free sulphur present in the gas to form sulphuretted hydrogen; while the rest unites with oxygen to form water, or with nitrogen to produce ammonia. The remainder of the oxygen is taken up by part of the carbon; and thus carbonic oxide and carbonic acid are generated.

It has been said that the production of the bisulphide of carbon is altogether a secondary action; but the writer has not found it to be so. He has found that as soon as distillation begins, bisulphide of carbon is produced. He took a portion of the gas each hour of the charge, passed it into a small holder, and tested it for this impurity in the first, second, and third hours of the charge. There was very little sulphur in the gas; but the bisulphide of carbon increased each hour, and especially in the last hours of the charge, after the coke was formed, as it is from the coke that much of the bisulphide of carbon comes. When the time came for the removal of this sulphur from the gas, it seemed that no one knew which was the best way to remove it. Up to 1860, no means of any kind had been tried for removing or for steadily reducing and controlling the sulphur in other forms than sulphuretted hydrogen. Several suggestions were made for reducing the sulphur. The first was to pick out the iron pyrites from the coal; but this did not reduce the sulphur. The second was to pass the crude gas through red-hot pipes. This, however, did not remove the sulphur; it only caused a deposit of soot in the pipes, and stopped the passage of the gas. The third suggestion was to mix lime with the coals. None of these proposed remedies had any effect. The bisulphide of carbon had nevertheless to be reduced; and the writer set to work until he found out the way to do it. He has already described his experiments on the purification of coal gas from this impurity, the result of which was the discovery that lime was the best agent for the purpose.

PHOTOMETRIC STANDARDS.

By W. Grafton, F.C.S., of Beckton.

(*Concluded from p. 97.*)

The Pentane Air-Gas Standard.

In all the published results of comparisons with this standard, no data as to barometer and temperature have been given; the latter being most important. The temperature has very much to do with the resulting composition of the carburetter air. The amount of pentane capable of volatilizing at 40° Fahr. is much less than at 60° or 80°. Experiments prove that at low temperatures the 10-candle standard flame gives more light; and the writer believes this may also be the case with the 1-candle standard. But whether or not the combustible material is not of constant composition, unless the temperature of the water and holder is at least above 58°, the 3 oz. of pentane will not wholly volatilize, and mix with the air, until the temperature reaches the before-mentioned figure. In taking the density of the pentanized air below this temperature, it is most difficult to get the same figure twice alike from the same sample; and, besides, the results obtained on one day may not agree with those obtained from a fresh sample of gas on another day. But when the temperature is between 60° and 70°, very concordant results can be easily obtained.

In using this standard for purposes of comparison, it should only be employed between the temperatures of 60° and 70° Fahr.; otherwise the 1-candle light is seriously affected. And it must only be used under similar conditions of temperature and the same kind of atmosphere as regards purity and humidity. This limits to a very great extent its every-day usefulness as a standard of comparison, unless tables of correction are made, which, in the writer's opinion, are inevitably necessary. The power of this standard must be more than any average candle, since the 10-candle standard is shown to be more than an exact multiple of the candle. Yet, according to the observers, agreeing with the 1-candle Harcourt clearly shows that some of the error attributable to the Didbin standard must be attached to the power of the pentane air-gas flame.

Other forms of standards were tried, but with unsatisfactory results. One may be mentioned by which pentane vapour was allowed to descend to the burner by gravitation. Since experimenting, Mr. Harcourt has devised a similar method; but it will not prove satisfactory in practice. The temperature of the liquid and of the surroundings is so variable that the air-laden vapours leaving the carburetter are not of constant composition. The percentage of air to pentane vapour varies greatly day by day, and also by the amount of time allowed the burner to get warm, which is equal to the time allowed for the carburetter to arrive at a constant point of temperature. The central air supply is defective, as it will be found that when the room temperature is greater than 65° Fahr., the quantity of air gravitating to the burner becomes less and less as the temperature rises. This is not to be wondered at, considering that the temperature immediately under and outside the bracket F tube is over 100° Fahr. Consequently the flame is not a perfect one, except perhaps at low temperatures, when the air supply is greater, and the pentanized air not so heavily saturated with pentane vapour.

A Weak Spot in Photometric Apparatus—The Disc.

The great importance of having good sensitive discs is very essential when experimenting, especially if accurate results are required. But it is equally so for everyday work. Discs have two distinct failings—one being that, when the disc is apparently equally lighted on both sides, it may yet be moved to the extent of three-quarters of a candle without being noticeably altered, since the centre spot is wholly lost; the other being where the centre spot of the disc is not and cannot be lost, but there remain two distinct rings. Like the first description of disc, movement can be made without any observable change, which some might hold entitles an observer to legitimately lean, innocently perhaps, one way or the other—*i.e.*, to read high or low as his mind dictated to him.

This piece of photometric apparatus is the crucial and principal part, and yet very little examination is devoted to it. The proper disc should have a sharp disappearing point—a point which cannot be otherwise than definite, decided, and conclusive, having no observable rings and no long disappearing centre. No amount of movement should be allowed over one-tenth of a candle on the scale. All discs should be passed through the hands of the Gas Referees before the Gas Examiners receive them; and none should be destroyed without their permission. I am aware that this entails work; but it is necessary. The Gas Referees, when they open a new testing-station, certify the instruments therein; and certainly the disc is one of them. This certified disc does not long last good, and is soon rejected by the official in charge of the station. The new one, however good, has not been certified, but simply chosen from a stock box, by choice of the operator, as a fit and proper disc. This should not be; and the examiner should not have the selecting of what might be called an impartial disc unless they are all certified.

Conclusions.

In concluding this prolonged investigation, the writer proves, by experiment and by actual working—

That the Dibdin 10-candle standard is not as represented to be.

That the so-called 10-candle standard is really equal to 10·47 certified sperm candles.

That the standard light is not reliable or constant—

(*a*) It is affected by the percentage of pentane vapour in the air;

(*b*) It is affected by small differences in the height of the flame;

(*c*) It is affected greatly by a close atmosphere; and

(*d*) Moisture largely affects it without going over a great range—the working range in the testing-stations being 50° to 84° Fahr., while occasionally a lower temperature may be found in winter.

That, if adopted, a correction for moisture must be made, and the aperture in the screen reduced by 3½ mm.—*i.e.*, the opening in the screen above the top of the steatite should be 51 mm. in height.

That the standard requires to burn at least 20 minutes before use, in order to cool the carburetter to a normal point.

That the air is always thoroughly saturated when leaving the carburetter; and by passing it over more pentane of the same temperature no augmentation of pentane vapour takes place.

That when the standards *are alike*, they agree to within 1 per cent. of each other, irrespective of the end of the photometer in which they may be fixed.

That the quantity of pentane in the carburetter affects the composition of the resulting carburetted air.

That coal gas is practically an equivalent of air as a carrier of pentane vapour at all temperatures above 60° Fahr.; very little difference in light-value being observable. For temperatures under 60° Fahr., less gas is required than air.

That the greater the rate of gas or air, the higher the power of the standard.

Methven Standard.

That the experiments relating to the Methven screen show that the light passing through the small slot from a portion of a 2½-inch pentane-gas flame is equal to 2 average certified sperm candles.

That this standard is reliable and practically constant; showing only ½ per cent. variation due to temperature and pentane vapour.

That moisture has no appreciable influence upon the portion of the flame used as the standard.

That the difficulty of setting the flame to 2½ inches is only imaginary when the atmosphere is still, as it is in a properly constructed photometer and room.

That much more delicate readings or observations of the disc can be made by the use of this standard than by one having a higher power.

The principle of the standard, as proved by experiment, is sound, and as near perfection as can be hoped for. *No whole* or greater part of a flame is or can be constant.

Pentane Air-Gas Standard.

Experiments show that this standard—the chief substitute for the sperm candle—is only reliable between the temperatures of 60° and 70° Fahr.

That if it agrees with the 10-candle standard having a 2·15 inch opening in the cut-off screen, it must be of greater value than one average certified sperm candle.

Harcourt Ten-Candle Lamp.

In its present form, it is not reliable.

It is too greatly affected by temperature, and the central air current is insufficient.

The power of the standard is variable.

Finally, discs as forming part of the apparatus, should be certified, as required from time to time, by the Gas Referees.

TECHNICAL RECORD.

SOCIETY OF CHEMICAL INDUSTRY.

Annual Meeting in Nottingham.

The Annual Meeting of the above-named Society was held in Nottingham last Wednesday and the two following days. The business portion of the proceedings (occupying only part of the first day) was transacted in the Lecture Theatre of University College, under the presidency of Dr. FRANK CLOWES, F.I.C., Chemist and Superintending Gas Examiner to the London County Council, who was for some years Professor of Chemistry and Metallurgy in the College.

The minutes of the annual meeting held in Manchester last year having been passed, the report of the Council was read. It was stated therein that the number of members on the register was 3196, compared with 3037 on the previous occasion. During the year, 311 new members had been elected, compared with 226 in 1896. This was the largest number since 1885, when 345 elections were recorded; though 1890, with 298, ran it close. The loss had been 152; among them being 28 deaths. The excess of revenue over expenditure amounted last year to £737 12s. 5d., compared with £1011 in 1896. The report of the Hon. Treasurer (Mr. E. Rider Cook) showed that last year there were 2818 subscribers, from whom a sum of £3524 12s. 11d. was received; the total receipts being £4738 16s. 9d. Both reports were adopted.

The President then delivered his address. He commenced by pointing out that the Society held their annual meeting in Nottingham in 1890, under the presidency of Sir Lowthian Bell, and the local chairmanship of Sir John Turney; the University College being then, as now, their head-quarters. In acknowledging the courtesy which the Mayor and Town Council had again extended to the Society by permitting the use of the College buildings, the President expressed the members' desire to congratulate the town upon having been raised to the dignity of a city, the present Mayor (Alderman E. H. Fraser, D.C.L., J.P.), upon having received academic distinction, and the Town Clerk (Sir S. G. Johnson) upon having received the honour of knighthood. They believed that the willingness shown by Nottingham to receive the Society must be connected with the progressive and hospitable spirit which the city had always shown, and with the existence in it of a large and successful University and Technical College, and of a flourishing Section of the Society.

In acknowledging the welcome accorded to the Society, the President said it was only natural to compare their present with their past position and their origin. The report of the Council informed them that the membership of the Society had reached a total of more than 3000; and it must be remembered that this large enrolment had been secured in a period of only seventeen years. Towards the end of June, 1881, the first general meeting of the Society was held in London under the presidency of Sir Henry Roscoe. The Society was then only three months old, and numbered about 300 members. It was in every sense a national society; but distinguished Continental chemists were willing to help the young association by taking up its membership. The first President stated that its main object was to bring together at definite intervals those who were interested in, or possessed knowledge concerning the utilization of chemical action on a large scale, and had charge of, or were connected with, those large branches of industry which are dependent upon chemical principles. He remarked that to the interchange of ideas brought about by such personal contact might well be added the publication of the proceedings of the meetings, as well as of information or intelligence interesting to the members. In this way, the Society could not fail to contribute to the advancement of those important branches of national industry which are dependent on chemical principles. Those who had noted, from these early days, the development of the scheme foreshadowed by their first President, could not but see how completely his intentions and predictions had been fulfilled. The Journal referred to by Sir Henry Roscoe had come into existence, and was one of the most complete and valuable records of technical chemistry in the world. Those who were interested in the advancement of applied chemistry in this country had become to a large extent united in their efforts, and therefore more successful in obtaining their objects. The members of the Society valued the organization on account of the information brought together in their Journal. But they had further advantages afforded them by the increased opportunity of meeting together, owing to the establishment of local Sections. The existence of these Sections was an important and somewhat special feature of the Society. They were now existent and active in London, Manchester, Liverpool, Newcastle, Nottingham, Leeds, Glasgow, and New York. The fact of there being a New York Section was an indication that the importance of the work of the Society was felt outside this country; and this was further proved by the very large number of foreign general members who had been enrolled.

The President then passed on to recognize the important services rendered by the Provincial Colleges in the development of the local Sections of the Society; citing as an instance his own experience in Nottingham of the advantages resulting from the establishment of a local Section with a local College. In 1881, the Town Council of Nottingham, supported by the public spirit of its inhabitants, responded to a challenge thrown out by an anonymous donor; and, by supplementing his handsome gift by public funds, built the stately and convenient buildings in which the members were then assembled. They also appointed a staff of teachers, and founded a curriculum of instruction in the principles and applications of science, which was in a great measure a response to the general demand for the provision of technical instruction throughout the country. It was felt desirable that the provision of general high-class culture should be the main object of University College, but that instruction should also be provided which would be of value to those who were equipping themselves for industrial pursuits in an industrial centre. The teachers in the College had, therefore, always borne in mind that while they taught scientific principles first and foremost as the true foundation of all industrial success, they should also in some considerable measure illustrate their teaching by pointing out the industrial applications of these principles. What could be more suitable and advantageous than the establishment, in connection with the Chemical Department of a College possessed of these aims, of a Section of the newly founded Society of Chemical Industry? In 1885 a little band of chemists of Nottingham and the neighbourhood started the Nottingham Section of the Society; and he (the President) was honoured by being its first Chairman. He had been tempted to speak at some length of the experience of the Nottingham Section not because he desired to place it in an unduly prominent position, but rather because the origin and development of the Section were, he believed, typical, and represented what had already occurred in most, if not in all, of the other Sections. He hoped the Society was destined to see a similar rise and development of new Sections in other important industrial centres of the country.

Having referred to the losses sustained by the Society during the past year through death, the President briefly alluded to two distinguished men connected with science and industry who have lately passed away—viz., Bessemer and Doulton. Their work had, he said, been so long before the world, that it was known not only to the chemists and metallurgists, but also to the general public. Men of their stamp were, he said, peculiarly English. It was the glory of England to have reared such sons; and among them—fortunately he was still hale and hearty, and in active work—must certainly be numbered the man whom the Council had this year selected for the award of its medal. He referred to William Henry Perkin. Like Doulton and Bessemer, Perkin had been the founder of a great and important industry. The production of artificial colouring matters from coal-tar products owed its origin, and in a large measure its development, to Perkin. As industrial chemists, the members would all undoubtedly be able to appreciate the great importance of this department of his work. He was an active supporter of the Society in its foundation and in the critical early years of its existence; and in 1884 he was elected to serve as its President—his immediate predecessors in that office having been Walter Weldon, Sir Frederick Abel, and Sir Henry Roscoe. From his early schooldays he had almost continuously followed scientific research as a recreation—even when he was founding and conducting a large chemical manufactory, and engaging in manufacturing and mercantile pursuits. Perkin went to the City of London School, where he (the President) deemed it an honour to have been associated with him. In 1851, he assisted in the preparation of the chemistry lectures at the school; and two years later, when he was only fifteen years old, he went to the newly instituted Royal College of Chemistry, with the intention of continuing his chemical studies under Dr. A. W. Hofmann. Perkin's rapid advance was marked by the fact that two years later he was acting as assistant to Dr. Hofmann in his research laboratory. The following March, he communicated his first research to the Chemical Society; and during the Easter recess (1856), while he was attempting to produce quinine artificially, he discovered aniline purple, or "mauve"—a discovery which laid the foundation of the extensive coal-tar colour industry of the present time. Experiments made at Pullars' dye-works at Perth, encouraged Perkin, at the early age of eighteen, to devote himself to the development of his discovery, and to extend the laboratory preparation of mauve to an attempt at its manufacture; and the result was that the new dye was sold to the silk dyer in 1857—the year immediately succeeding its discovery. The success achieved by Perkin in making and applying the new dye was rapidly followed by the introduction of additional coal-tar colours, to the discovery and application of which Perkin

himself contributed. The credit remained to him of producing Graebe and Liebermann's artificial alizarine, or madder-dye, by an improved and practicable method, which led to the artificial manufacture of the madder-dye taking the place of its preparation from the cultivated root. In 1859, the Industrial Society of Mulhouse awarded a silver medal, and some time afterwards a gold medal, to Perkin for his discovery of mauve. He was elected to the Chemical Society in 1856, the Royal Society in 1866 (at the early age of 28); to the honorary secretaryship of the Chemical Society in 1869; to the presidency of the Chemical Society in 1883; to the presidency of their own Society in 1884; and to the honorary membership of the German Chemical Society in the same year. Their own Society's medal to Perkin was an addition only to others already in his possession; including the Royal Medal of the Royal Society (1879), the Longstaff Medal of the Chemical Society (1888), the Davy Medal of the Royal Society (1889), the Albert Medal of the Society of Arts (1890), and the Birmingham Medal of The Gas Institute (1892). Academic distinctions had also been accorded to this truly eminent man, and were evidence of the fact that his honours came from widely different sources. The University of Würzburg conferred upon him the title of Ph.D. at its centenary celebration in 1882; and the University of St. Andrews gave him the honorary degree of LL.D. in 1892. This was a long, but he (the President) feared an incomplete, list of the honours conferred upon their medallist of this year.

The President next alluded briefly to some matters of applied science which had of late years come prominently under his notice. First to be mentioned were his researches and experiments for detecting and measuring fire-damp, or methane, in the air of mines. Careful experiments, which were widely extended both in the laboratory and in the mine, led him to infer that no simple and practicable method equalled in these respects the hydrogen flame when safely and suitably applied. The "flame-cap" over the standard hydrogen flame, as seen in the suitably-fitted safety-lamp, not only detected, but measured fire-damp with great precision. This standard test-flame had since been adapted to the detection and measurement of coal gas in air; and, in conjunction with Mr. Boverton Redwood, their newly-elected London Chairman, he had applied it also to the detection and measurement of petroleum vapour in the atmosphere.*

The next matter noticed was acetylene, concerning which the President remarked that its general adoption for illuminating purposes is being delayed by the feeling that the gas is dangerous. In the liquid condition, acetylene could undoubtedly, owing to its endothermic character, undergo most violent explosive decomposition; yet Raoul Pictet strongly urged that the liquid is safe if suitably prepared and stored. In the gaseous form, Professor Lewes had given the assurance that the gas does not undergo this explosive decomposition when stored under a pressure less than two atmospheres. He further stated that this gas might, if properly prepared, be burnt in such a way as not to rapidly cause obstruction in the burners—a difficulty which had caused trouble in the past. He further stated that while it was not of use for enriching coal gas, it was a valuable enricher of oil gas. It was to be hoped that the public might ultimately receive satisfactory assurance that they could employ acetylene as an illuminant with success and safety under suitable conditions. When mixed in very small proportion with air, acetylene furnished an explosive mixture; but danger arising from this cause must certainly be looked upon as preventible. The enrichment of coal gas, which it was hoped might have been effected by acetylene, was now usually secured by the indirect employment of water gas. The large amount of poisonous carbon monoxide which was thus introduced into the enriched gas had naturally led to apprehension; while the use of carburetted water gas had certainly given rise to serious loss of life. The substitution of a comparatively non-poisonous and highly illuminating gas, such as acetylene, for enriched coal gas might be one of the solutions of the attempt to furnish the public with gas of high illuminating power.

The address closed with some remarks on the disposal of town sewage, the development of the process of treating which by artificial filtration through coke or other suitable substances would, the President said, be watched with interest by those specially concerned with this important problem. Such filtration was known to secure oxidation of the putrescible matter of sewage indirectly through the intervention of bacteria.

On the motion of Mr. G. Beilby (the President-Elect), a hearty vote of thanks was accorded to Dr. Clowes for his address.

The President then, amid loud applause, handed the medal of the Society to Dr. Perkin, who expressed his thanks to the members for the honour they had conferred upon him. He said that from his earliest acquaintance with chemistry, and while a schoolboy, the idea of working at experimental research and the possibility of making scientific discovery, became a leading thought in his mind. Since then he had found practically how important was research, not only from a scientific but also from a technical point of view; so that he had as far as he could sought to impress others with its value and the great importance of cultivating it. One of the greatest fears he had when he was led into technical work was that it might make it impossible for him to continue to follow scientific investigation, though he determined to do so if possible, because in those days very little research, properly so-called, was carried out in chemical works—very few even possessing laboratories. But now it was gratifying to find that its practical importance was by many manufacturers more fully realized, so that it was getting understood that it is absolutely necessary, if progress is to be made, that a chemical works should be a place of research as well as a factory. This state of things had been brought about by the coal-tar industry, which was the most remarkable evidence of the value of scientific research to technical work that ever existed—in fact, had it not been for research, the very raw materials required in this industry would not have been known. Its birth also took place during the prosecution of research; and its wonderful development had also been due to research. It was very useful to remember that, while this industry had been so greatly benefited by this means, it had, in return, most bountifully furthered science by handing back to it for investigation new materials which could not otherwise have been obtained, and also by bringing forward new problems to be solved, and by doing this had been again enriched with fresh fruit for science. Thus technical and scientific work had gone together, hand-in-hand, to an extent never before experienced. This condition of things had now spread to other chemical industries. There was also another interesting matter connected with the influence of the coal-tar colour industry on technical chemistry, and that was in relation to chemical plant. At the time when this industry was commenced, the plant used in chemical works was mostly of a crude nature; and none of it was suitable for the new industry, where the products were costly, the operations delicate, and in many cases the chemicals used of a very active and corrosive nature. This necessitated the invention of new plant of a much higher order than that in use at that date—requiring for its construction a good knowledge of chemistry and physics, as well as of engineering, &c.; and the use of this higher class of plant in the colour industry had a large influence in improving the character of that now used in chemical works generally. He alluded to these matters because it was a great satisfaction to him to see the wonderful spread of scientific work and the great advance of technical work which had taken place, directly and indirectly, by the development of the coal-tar colour industry, the foundation of which fell to his lot.

The result of the ballot for office-bearers for the ensuing year was then announced; and Mr. Beilby returned thanks for his election as President.

The business then concluded.

Subsequently the members partook of luncheon provided by the Nottingham Section of the Society. At its conclusion, Professor Clowes proposed, and Mr. G. Beilby seconded, a vote of thanks to the Section for their hospitality; and the proposition was most cordially passed. In the afternoon, by the kind invitation of Alderman Sir John Turney, J.P., the members were entertained at a garden party at his residence, "Springfield," Alexandra Park. In the evening, a *conversazione*, given by the Mayor and Mrs. Frazer, was held in the Art Museum at the Castle.

Thursday was fully occupied with visits to local works; the annual dinner of the Society being held in the evening at the Exchange Hall.

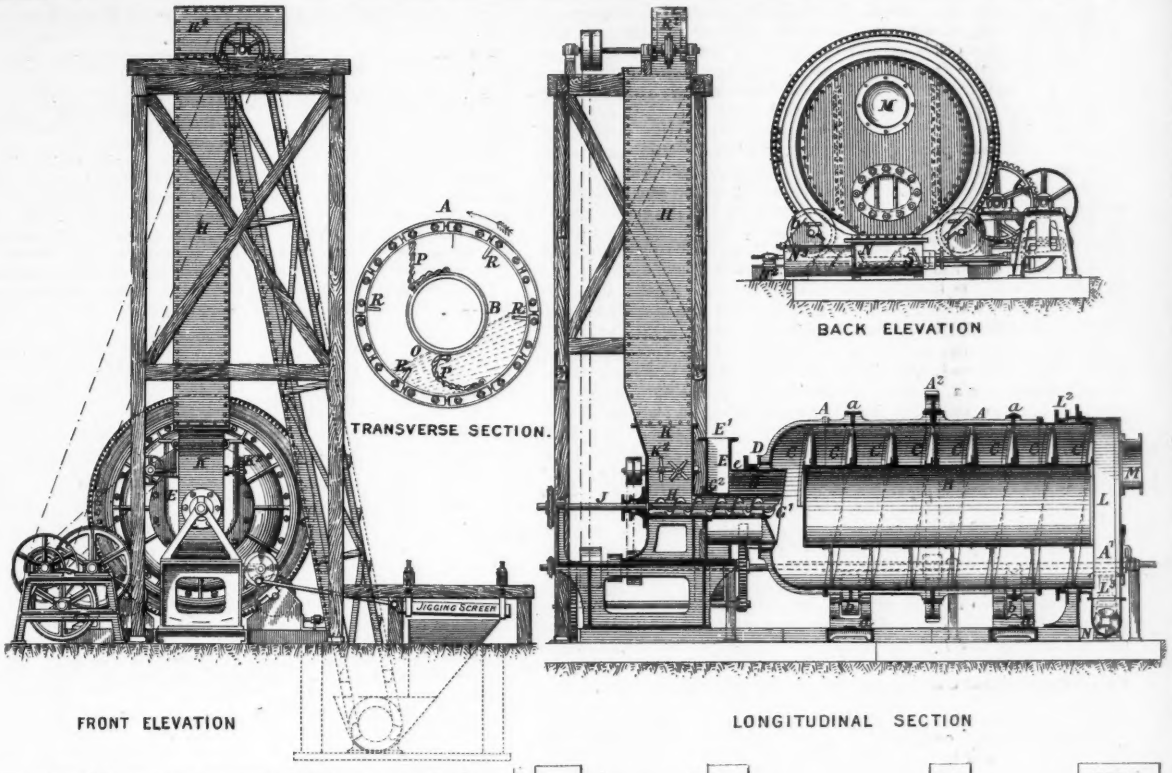
On Friday there was an excursion to Lathkill Dale, Haddon Hall, and Chatsworth House; and with this the meeting closed.

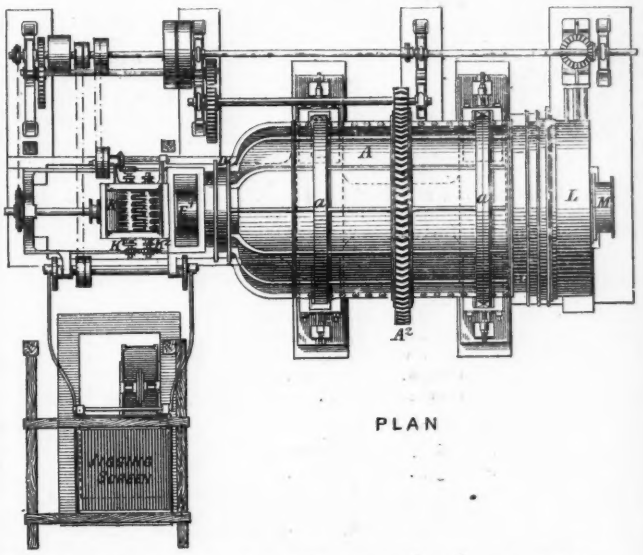
* These researches have been noticed from time to time in the "JOURNAL."

YEADON'S MECHANICAL PURIFYING MACHINE.

In the course of his Inaugural Address to the Manchester District Institution of Gas Engineers last February, Mr. W. S. Haddock, the Engineer of the Warrington Corporation Gas-Works, made the following remarks regarding the purification of coal gas: "A new and more satisfactory method of purifying gas than the one now in use is much to be desired. The opening of the purifiers always gives rise to some danger. . . The work to be performed is of a disagreeable nature, and to some extent objectionable to those living in the neighbourhood of a gas-works. A large area of land is required; and the building and plant are costly both to erect and maintain." Directly on the publication of Mr. Haddock's address, Mr. Yeadon, whose name will be familiar to our readers in connection with the revolving retort he designed some years since, communicated with the "JOURNAL" saying that he was interested in an invention at that time being protected by patent, which he said would to a very large extent meet the views expressed by Mr. Haddock. Mr. Yeadon has since sent us a copy of his specification and the drawings accompanying same, so as to enable us to fully describe to our readers what the proposal is.

The specification points out that the invention "consists in the use or application of a cylinder revolving horizontally on bearing-rollers, having attached within it a continuous internal spiral screw, and fitted with a stationary mouthpiece or box at each end, by means of which the revolving cylinder, lime, oxide of iron, or other analogous materials used for purifying gas can be continuously and automatically conveyed into, through, and out of the cylinder; while at the same time the crude unpurified gas meets with, and passes regularly and continuously through, the purifying material as it passes through the cylinder." The patentees, *inter alia*, claim that the use of





their invention would serve "to economize labour, ground space, and lime, to save the waste of gas ordinarily lost in the present intermittent method of charging and emptying purifiers, and to prevent the nuisance and danger connected with such method." The patent, which is taken out in the names of Arthur Edward Nield Yeadon and Samuel Nield Yeadon, of Albion Place, Leeds, is No. 2444 of the present year. The patentees state that they prefer to make their cylinders parallel with a horizontal central line, as shown in the engravings; but they can also be made of a conical form, or, again, parallel and sloping.

It will be seen from the engravings that inside the cylinder A, and running nearly the whole length of it, there is a central tube B closed at one or both ends, and of a diameter proportionate to the cylinder. Between the outside circumference of this tube and the internal surface of the cylinder, there is fixed the continuous spiral screw C C, running the whole length of the cylinder; both edges of this screw being fitted with angle iron for securely fixing it to the cylinder and tube, and made perfectly gas-tight. The tube is thus carried by the cylinder to which it is attached by the spiral screw. The feeding end of the cylinder is rounded off as shown at D, and fitted with a gland and stuffing-box, through which passes the front part of the double mouthpiece E; the outside of this being turned true and smooth, at *e* to work in the revolving gland D. The mouthpiece consists of the external pipe, one end of which is open and extending a little way inside the cylinder, as shown at F; the other end being closed, but having an outlet E^1 on the top or side for the passage of the purified gas. Passing through this external pipe, in any part of it, there is fixed an internal pipe G, for feeding in the fresh lime, which pipe has its delivery end open and extending a little beyond the open end of the external pipe into the cylinder, as shown at G^1. The other end of this internal feed-pipe passes through the back or closed end of the external pipe at G^2, and is fitted at the top with a hopper-mouth H^1; this end being fitted with a gland and stuffing-box to prevent escape of gas. Through these, and working inside the feed-pipe, is a revolving shaft J, driven by any suitable means outside, having fixed on it a spiral screw (as shown) or adjustable blades for conveying the lime into the cylinder. Above the hopper-mouth is fixed a hopper-box K, inside which revolve, at different speeds, two shafts K^2, fitted with knives for breaking up and regulating the quantity of lime passing through. Above this there is fixed the hopper H, of any suitable height, so that the head of lime may prevent escape of gas; or, if desirable, a valve may be fitted at the top and another at the bottom for the same purpose. The opposite end of the cylinder is open, as shown at A^1, and revolves in a stationary closed end-box L, which is fitted with a suitable gas-tight gland L^2, inside which the turned end of the cylinder revolves. M is the inlet-pipe for the crude gas, fixed near or on the top of the end-box, at the bottom of which is an outlet L^3 for the foul lime. Attached to the end-box, and underneath the outlet, can be fixed any suitable arrangement of gas-tight boxes and valves for intermittently discharging the foul lime without waste of gas. But the patentees preferably employ a circular discharge-pipe N, in which revolves a shaft S, fitted with adjustable blades, as shown; and by keeping this shaft shorter than the end of the discharge-pipe at N^2, they ensure the end of this pipe at N^3 being tightly filled with the foul lime, thus securing its continuous and automatic discharge without any escape of gas. On any part of the circumference of the cylinder A, there are turned bearing-rings *a a*, preferably V shaped, to secure it from moving endwise. Each of these rings revolves on suitably shaped bearing-rollers *b b* underneath, having boxes *d d*, and tightening screws to regulate the height of the cylinder when working. There are also fixed one or more toothed wheels A^3 on the circumference, to be driven by pinions or other suitable means on any driving shaft which can be fixed in any suitable position as required. The end of the spiral screw C and the open end of the cylinder at A^1 can be suitably arranged, if required, to hold back the lime a little, so that by this means and adjusting the speed of the breaking shafts K^2, the height or level of the lime in passing through the cylinder shall always be uniformly higher than the central tube, as at O in transverse section; preventing the gas passing over the surface of the lime, instead of through it. By way of breaking up the lime and keeping it open and free from clogging as it passes through the cylinder, there is fixed in each division of the spiral screw one or more slack breaking chains, as shown at P P; also breaking knives R, which can be fixed to the inside of the cylinder or outside the central tube, or both.

In operation, the fresh lime would be delivered by the elevators R^3 into the hopper H, the height of which is regulated so that the "head" of lime is sufficient to prevent any escape of gas through it. As the lime falls into the hopper-box K, the speed of the breaking shafts K^2 regulates the quantity to be passed into the cylinder. The speed of the shaft J is likewise adjusted

so as to pass the lime quickly through the internal feed-pipe G, without pugging or clogging, into the interior of the cylinder. The revolving motion of the cylinder A, with the continuous spiral form of the internal screw C, with the help of the slack chains P P and the knives R R, keeps the lime open and works its continuously and regularly forward through the cylinder, wherein by its contact with the impurities in the crude gas entering at M and passing through it, the lime becomes foul, and falls into the outlet-box N, from which it is continuously and automatically discharged by the rotating shaft and blades S through the outlet-pipe N^2. The level of the lime in passing through the cylinder is always kept sufficiently and uniformly above the bottom of the central tube B, as clearly shown at O. The crude gas entering at M into the end-box L meets and passes through the lime in the cylinder in each of the divisions of the screw C, and finally escapes through the double mouthpiece E at the outlet E^1, whence it is conveyed to the meter.

When sending the papers from which the above particulars have been extracted, Mr. Yeadon forwarded the following basis of calculation for a comparison between the ordinary system of gas purification and the Yeadon arrangement. For the latter, of course, the figures can only be assumed, for no accurate data as to the capability of the machine can possibly be given until it has been thoroughly tested on a working scale.

Ordinary Gas Purifiers.

Hydrated lime is (say) double the bulk of quicklime. Of the latter, one cubic foot weighs 56 lbs.; and 80 lbs. will purify 10,000 cubic feet of gas. A cubic foot of hydrated lime is of the same weight (56 lbs.) as a similar bulk of quicklime; but twice the quantity (160 lbs.) is needed for the purification of 10,000 cubic feet of gas. The area of purifiers required in the ordinary system to pass (say) 3½ million cubic feet of gas per day is (say) 7000 square feet for boxes and valves, the cost of which would be £8000; labour costing 3d. per 10,000 cubic feet of gas.

Yeadon Purifier.

For an assumed capacity of 3½ million cubic feet per day, the dimensions would be as follows:—

Length.	Diam. of Shell.	Diam. of Tube.	Pitch of Screw.
12 feet ...	6 feet ...	3 feet ...	1 ft. 6 in.

Speed	Four revolutions per hour.
Circumferential velocity	1 ft. 6 in. per minute.
Diam. of inlet and outlet pipes ...	20 in. = 314 sq. in. area.
Passage in screw for lime (say)	18 in. by 18 in. = 324 sq. in.
Ground area required (say) ...	40 ft. by 25 ft. = 1000 sq. ft.
Estimated quantity of quicklime used per day ...	12½ tons.
„ cost of labour	1d. per 10,000 c. ft. of gas.
„ cost of the purifier complete, including engine, screen, two pairs of elevators, and foundation, delivered and erected (say)	£750.

Then—

Diam.	Sq. In.
Shell . .	6 ft. = 4071·51 area.
Tube . .	3 ft. = 1017·87 „
	3)3053·64 area of lime space all round.
	1017·88 „ „ „ „ ⅓ „

Then—

Area. Length.
1017 × 144 = (say) 84 cubic feet, one-third round.
1728 = cubic inches per cubic foot.

Hydrated lime weighs ½ cwt. per cubic foot. Then—
84 × ½ cwt. = 42 cwt. the "charge" of hydrated lime; say 41 cwt., to allow for blades and angle-irons. The purifier runs (say) eight revolutions in two hours. Then—
8 rev. × screw pitch 1 ft. 6 in. passes the full charge, 41 cwt. of *hydrated* lime (length of cylinder, 12 feet) in two hours; say 25 tons per 24 hours (*i.e.*, 12½ tons of *quick* lime), 160 lbs. of hydrated lime will purify 10,000 cubic feet of gas. Then—
25 tons ÷ 160 lbs. = 350 times.
350 × 10,000 = 3,500,000 cubic feet of gas purified per 24 hours.

Comparison of Cost of the Two Systems.

	Area Required.	Cost of Plant.	Labour.
Ordinary .	7000 sq. ft. .	£8000 .	3d. per 10,000 cubic feet.
Yeadon's .	1000 „ „ .	£ .	1d. „ „ „ „

With the Yeadon system, it is claimed that no gas is wasted, as with "changing boxes" in the ordinary system.

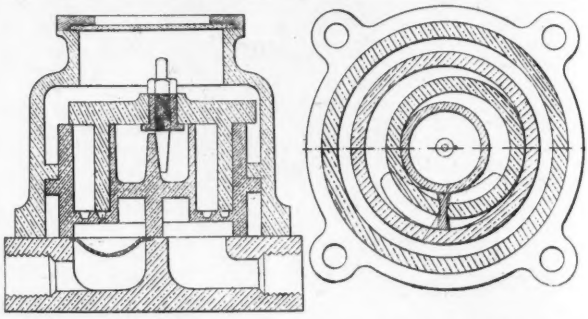
Heating Calcium in Hydrogen.—In the current number of the "Comptes Rendus," M. Moissan shows that if pure calcium be heated in hydrogen, the metal takes fire and burns energetically, forming the hydride CaH_2—a transparent crystalline substance stable at a high temperature. It behaves as a strong reducing agent, and is violently decomposed by cold water; giving off one-seventh of its weight of pure hydrogen gas.

REGISTER OF PATENTS.

Water-Meters.—Hill, J. K., of Walton-on-Thames. No. 11,745; May 11, 1897.

This invention relates to water-meters of the oscillating piston type; and its object is to produce a meter having positive action and no dead-point, and one which is self-adjusting as to wear.

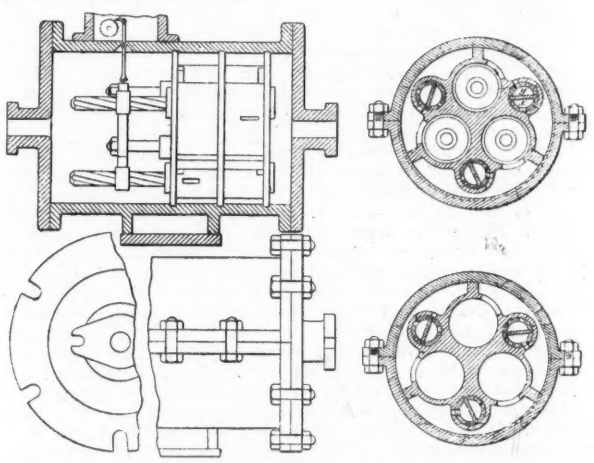
In one arrangement, as shown, there is a circular casing closed at the top, and having within it a cylinder, divided by an internal cylinder, so as to produce an annular piston-space or ring. This ring-space is divided by a transverse vertical partition; and the ports for the admission and the discharge of the water to be measured are arranged on each side of the transverse partition at the bottom of the cylinder. The ports extend within the annular space on both sides of this transverse division; and they are so shaped as to provide gradual opening and closing, as determined by the movement of a ring-shaped piston. The piston has a slot



across its depth, which fits over the transverse partition; and the ends of the piston at the slot are rounded so as to enable the ring to fit with some accuracy to the partition in all the positions of the piston. The ring-shaped piston fits the whole depth of the annular space forming the cylinder; and it is sometimes provided with a cover-plate, which fits over the top of the cylinder so that the top plate rubs upon the upper end of the cylinder while the bottom of the piston rubs on the bottom of the annular cylinder. The water passes in to the annular space on one side of the piston and the other side alternately; so that the expanding space to be filled with the water to be measured is alternately formed between the outside surface of the piston and the cylinder, and the inside surface of the piston and the inner cylinder. The piston is preferably made of vulcanite, and is supplied at the centre of its cover plate with an inwardly projecting conical pin, which works around an opposing conical pin. The piston is caused to describe a path round and round the cylinder; the inside and outside surfaces alternately having bearing contact with the opposing surfaces of the annular cylinder. By this arrangement, the piston so moves as to produce extending and contracting spaces; and the ports are so arranged that no dead-point occurs either in admission or exhaust. In this way, the piston works its own joint top and bottom, and always remains tight.

Water-Meters.—Dobbs, A. E., of Lincoln's Inn, W.C. No. 13,516; June 1, 1897.

This meter has three or other larger odd number of cylinders, each fitted with a piston, and each end of each cylinder capable of being put alternately into connection with the supply and with the delivery through suitable valves, in such a way that, when one end of a cylinder is open to the supply, its other end is open to the delivery. The movement of the piston of one cylinder is made to shift the position of the valves of the next cylinder in such a manner that—say, the left-hand end of one cylinder is open to the delivery, and its piston is consequently travelling to the left—the valves operated by this piston will be shifted to such a position that the right-hand end of the next cylinder will be opened to the delivery, and its piston consequently made to travel to the right; and so on in succession.



One way in which this is effected is shown in the engraving. Here a casing, preferably cylindrical, is divided longitudinally so that it can be separated into two halves; the ends being closed, and an inlet or supply pipe leading to one end, and an outlet-pipe passing from the other. Across the casing is fixed a partition plate parallel with the ends. This plate has three cylinders passed through it in such a way that one-half of

each cylinder is on one side of the plate, and the other on the other side. The cylinders are side by side, and preferably equi-distant from one another and from the centre of the partition. Two further partition plates are fixed across the interior of the casing—one on either side of the central partition, and between the ends of the cylinders and the ends of the casing; or the partition plates might themselves form the ends of the cylinders. The space between each of the two plates and the central partition plate is divided radially into three closed compartments. One end of each cylinder opens into one or other of the three closed compartments on one side of the central partition; and the other end of each of the three cylinders opens into one or other of the three closed compartments on the opposite side of the central partition. Through each corresponding pair of closed compartments that are on opposite sides of the central partition, a fixed tube or pair of fixed tubes is made to pass—the tubes pass through all the partition plates, and are open at their ends. Each of the fixed tubes has fitting within it an inner tube, capable of being moved endwise to-and-fro, or of being partially rotated on its axis. If a pair of fixed tubes is used, one inner tube of each pair is closed at one end, the other at the other end. One is, therefore, always open to the inlet end of the casing; the other to the outlet end.

Ports are formed through the sides of the fixed tubes, and through their inner tubes, which (by the movement of the inner tubes) can be brought to coincide with one another or not to coincide. The ports are so placed and the inner tubes so moved that, when one inner tube is open to the compartment on one side of the central partition, the other inner tube is open to the corresponding compartment on the opposite side. Each pair of inner tubes may receive an endway to-and-fro motion from one end of a rock-lever, the other end of which is acted on by the piston-rod of the piston of one of the cylinders—not from the piston of the cylinder which opens into the compartments that the tubes pass through, but from the piston of the preceding cylinder. Thus as the piston of one cylinder travels from one end to the other of the cylinder, it shifts the valves belonging to the next cylinder; and when near the end of the stroke, it brings them into position for causing the piston of this cylinder to travel in the opposite direction from one end of the cylinder to the other, and in so doing to shift the valves for the third cylinder, and so on continuously.

Gas Pumps or Compressors.—Keith, J., of Farringdon Avenue, E.C. No. 14,057; June 9, 1897.

This invention—relating to apparatus for increasing the pressure of gas or for forcing air, and having for its object the economy of the water used in working—comprises a pump, which consists of a cylinder provided with an annular water-space, into which a small gasholder dips. The water acts as a seal; and when the holder is moved up and down by means of the water motor forming part of the apparatus, the gas or air is alternately drawn in and expelled above or below the holder or float. The spaces above and below the float are connected by ports to a valve-chamber, having suitable inlet and discharge valves for each space. The annular water-space is kept charged with water from the exhaust of the motor which is led into the bottom of the space, and overflows into the centre of the cylinder. The water fills up the interior of the cylinder to the height of an overflow-pipe situated in the cylinder, and provided with a deep trap to prevent the gas from being blown out; and the overflow water is discharged from the trap at about the level of the overflow in the cylinder. The water in the annular space rises and falls alternately on the inside and outside of the holder, to a height equal to the difference in pressure on the inside and outside of the holder. The water motor is of the double-acting differential type, as described in patent No. 20,573 of 1896; and it acts in a similar manner.

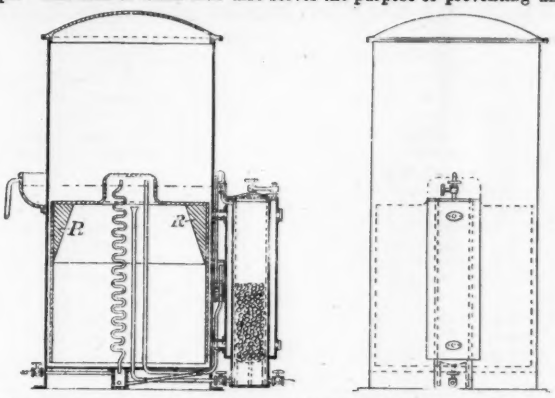
Purifying and Enriching Acetylene Gas.—Bean, H. R., of Plaistow, and Ringwood, H., of Poplar. No. 14,700; June 17, 1897.

In order to overcome the difficulty experienced in burning acetylene gas—consequent on its poorness in hydrogen—through ordinary gas-burners, the present inventors propose to introduce an alcoholic or spirit vapour, which combines with the acetylene, and imparts to it an element which enables the excess of carbon to be consumed more readily at the burner. There is also said to be another advantage: The gas is filtered or cleaned from any dust or foreign matter that may be intermingled with it on its way from the generator.

A vessel or holder of any convenient shape, of iron or other suitable material, and having a false bottom, is filled with fibrous material—wool or worsted being very suitable. At the lower portion of the vessel, below the perforated bottom, an inlet is made for the gas to enter; and above the fibrous material an outlet is made for the gas to be taken off for use as required. The fibrous material is saturated with methylated spirit, alcohol, or spirits of wine; and the acetylene gas, in passing through it, takes with it a considerable amount of spirit vapour, and becomes as it were impregnated with it, and thus combustion is rendered more perfect and economical."

Generating Acetylene.—Scarth, J. W., of Pudsey. No. 15,125; June 24, 1897.

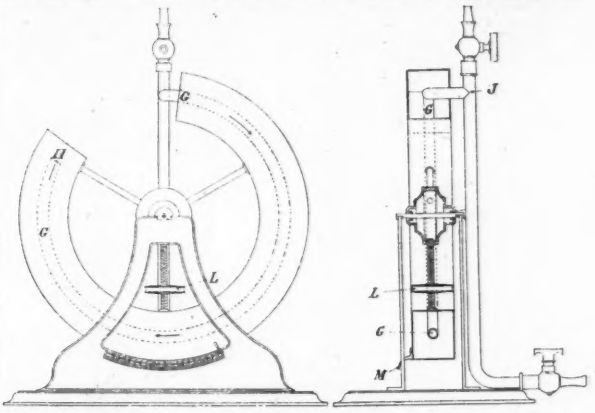
The action of the apparatus shown in the engraving, as constructed according to this invention, is as follows: The cylinder is filled up to the water-level; and the level of the water in the holder reaches close to the top of the water-pipe. On opening the supply-pipe to the burners, the gas in the upper part of the holder passes down through the condenser pipe, and allows the holder to descend. In doing so, the displacer R causes the water to rise in the holder and overflow down the water-pipe to the lower part of the generator; and on coming in contact with the calcium carbide, the water is decomposed, and acetylene generated. The gas as generated passes off from the upper end of the generator to the upper part of the holder; and if the production is more rapid than the consumption, the holder is raised and the water level falls below the mouth of the water-pipe, stopping the water supply and the generation of gas. The generation of gas, however, does not cease immediately, if there is a considerable quantity of water in the pipe; and this suffices to reach the level of the undecomposed carbide. By closing the stopcock, or by a water-lock, the gas generated may be prevented from passing direct to the holder; and exercising a back-pressure on the water in the generator, it forces the water back below the undecomposed carbide into the water-pipe. The cock or water-lock also serves the purpose of preventing any



back-flow of gas from the holder to the generator, which provision is necessary to prevent the gas travelling back from the holder when the generator is being recharged.

Pressure-Gauge.—O'Connor, H., of Edinburgh. No. 17,351; July 23, 1897.

This invention consists of a tubular chamber (of round, oval, rectangular, hexagonal, or other convenient diametrical section), bent to form about three-fourths of a circle, and made with one end closed. To this tubular chamber are fitted arms or spokes connecting it to a central boss, through which passes an axle; or a complete disc or discs may be fitted to connect the tubular chamber with the axle. The tubular chamber is furnished with an inner tube G, of smaller diametrical section, bent to the same curve, and made to fit inside, so that the tubular chamber may be partially rotated about its axis without touching the inner tube. The upper end of the inner tube is connected to the supply of gas at J; while the opposite end—that nearest the closed end of the tubular chamber—opens into the interior of the latter. When it is desired to put the apparatus into operation, the tubular chamber is partially filled with liquid, (care being taken that such liquid does not rise so high as the open end of the inner tube). The gas being admitted, passes by means of the inner tube through the water and issues at the open end H of the inner tube



into that portion of the tubular chamber above the water-level, exerting pressure in all directions (and causing the water to fall on that side and to rise at the open-ended side of the tubular chamber, at the same time), against the sides of the tubular chamber. Above the level of the water, the pressure upon the closed end of the tubular chamber overcomes its dead-weight (which is greatest at the bottom), and causes it to revolve upon its axis in the direction of its closed end to a greater or less extent, according to the amount of the pressure and the area of the closed end. A pointer M fixed on the circumference of the tubular chamber indicates upon a stationary dial the extent of the revolution, and thereby the amount of the pressure. The registering capacity of the instrument can be increased to indicate higher pressures, either by altering the position—relative to the centre—of a weight L fixed on one of the spokes or on the disc or discs, or by attaching to the lowest portion of the tubular chamber such loose weights as may be necessary to counterbalance the varying pressures.

When it is desired to utilize the apparatus for recording purposes, there is attached to the tubular chamber a pen or pencil inscribing upon a record paper attached to a moving barrel or disc.

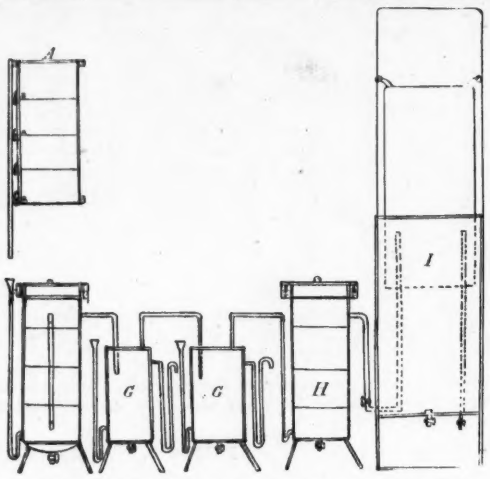
Internal Combustion Engines.—Rowden, W. T., of Lenzie, N.B. No. 19,910; Aug. 30, 1897.

The patentee claims: (1) In an internal combustion engine with tandem cylinders, a method of construction which consists of making the cylinder more distant from the crank-shaft larger than the other by an amount sufficient to pass the undivided cover of the latter. (2) In an internal combustion engine of the Beau de Rochas cycle, with tandem cylinders, the use of a non-working side of one piston and cylinder in one line of cylinders as an air-pump, for providing scavenging charges for the cylinders of another line.

Manufacturing Acetylene.—Wigham, J. R., of Dublin. No. 18,971; Aug. 17, 1897.

This invention consists in placing the calcium carbide in cylindrical vessels with internal moveable divisions, and in applying water to each

division in succession (from a cylinder, of precisely the same capacity as that containing the calcium carbide, placed at a higher level), as shown in the engraving, with or without gauges for permitting the process of



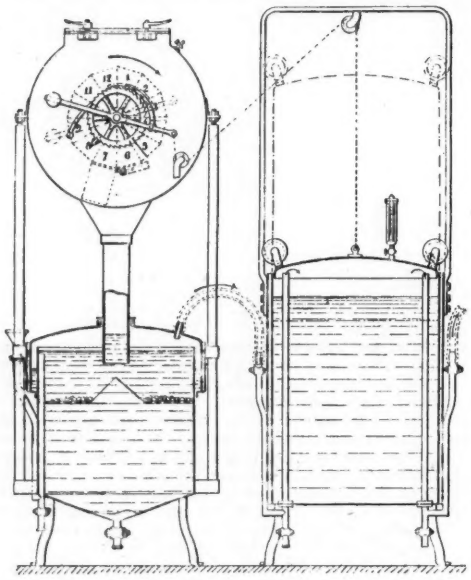
gas manufacture to be watched as it progresses, and with valves by which the process can be arrested at pleasure. The usual washing and drawing-off arrangements are applied; and the gas as it is made is stored in a gasholder of ordinary construction.

Another part of the invention is that the gas-making cylinder is sealed with a lute of mercury; so that the cover may be removed and replaced instantly without the application of screws or such appliances.

The water reservoir A is divided into four parts. G are the washers; H, the purifier; and I, the storage holder for the gas.

Production of Acetylene Gas.—Barthez, A. H., of Hamma, Algiers. No. 25,870; Nov. 6, 1897.

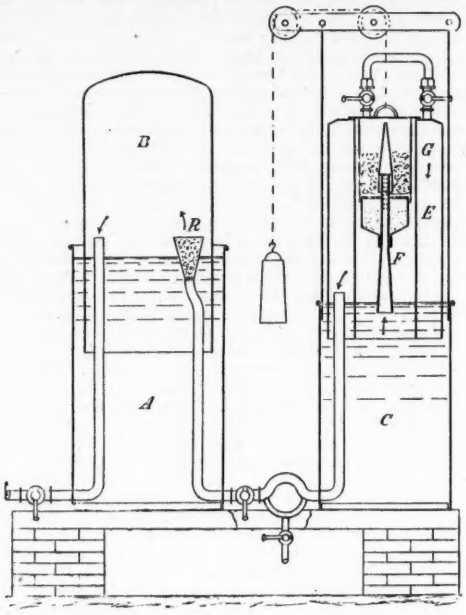
This invention relates to "the automatic production of acetylene gas for domestic and industrial purposes," in apparatus such as is described in patent No. 9294 of 1897. The present improvements consist (as shown) in extending the carbide feed-tube or shoot for a certain distance below the surface of the water in the gas generator, and disposing beneath its delivery-orifice a distributing cone, down the side of which the carbide will roll, and be spread upon a grid arranged in the generator. With



such an arrangement the acetylene disengaged cannot have access (by way of the feed-shoot) to the receiver, which contains the distributing bucket-wheel described in the former patent, so that it becomes unnecessary to hermetically close the receiver, which may be opened for recharging without allowing the acetylene stored in the generator to escape.

Producing Acetylene Gas.—Sockeel, V., Lauby, A., Drisse, C., and Sneck, A., of Calais. No. 28,439; Dec. 2, 1897.

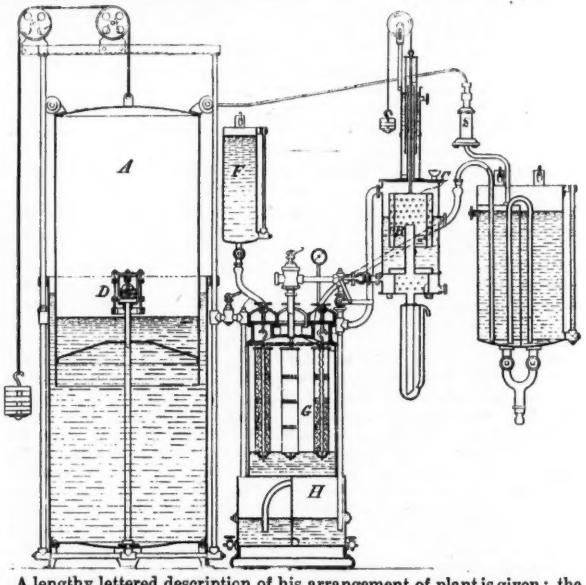
The apparatus constructed according to this invention consists of a cylinder A containing water, a bell B, and a cylinder C also containing water, in communication with A by a pipe. Further there is a bell E, which contains a truncated cylinder F, which itself encloses another truncated cylinder G, called the "cartridge," and into which is introduced the carbide of calcium. The cartridge is traversed longitudinally by a pipe perforated in the upper part and plain below. This is placed in contact with the water in the cylinder C. The bell E is formed by two concentric cylinders joined together at the top, and open at the bottom; and the cartridge is placed in the central space. The cartridge has at its top a cock giving communication with the bell E. Thus the cylinder E and the cartridge G are connected with the water in the cylinder C. The gas is generated and passes into the cylinder E, and thence into the holder B. R is intended to receive materials for purifying and desiccating the gas. The cartridge is divided into two chambers, separated by a



perforated diaphragm. The carbide is in the upper chamber; while the milk of lime resulting from the reaction falls into the lower chamber, from which it can be extracted when renewing the charge.

Acetylene Generating and Purifying Apparatus.—Richard, B., of Lyons. No. 28,798; Dec. 6, 1897.

This apparatus is designed to effect the supply of water to the carbide of calcium in proportion to the production of acetylene. The patentee has (like others) found it necessary to make the carbide operate on a sufficient quantity of water, in order to avoid as far as possible the formation of polymerized products under the influence of the heat, which is produced during the chemical reaction. By means of his system, "the lime never covers the carbide; consequently the latter cannot become dry. The carbide of calcium thus produces the maximum volume of acetylene; since the hydrate of lime does not contain any particle of undecomposed carbide of calcium."



A lengthy lettered description of his arrangement of plant is given; the main features of which will be gathered from the subjoined claims advanced for the invention: (1) An automatically closing acetylene gasholder A (as shown in the engraving), having its closure D disposed interiorly within the receiver. (2) An acetylene generator consisting of a chamber forming one body with a chamber H, divided by a diaphragm into two compartments with a bent tube fixed in place by its mouth in the diaphragm, and constituting a purifier. The chamber G carries besides at the top openings with covers each with a hook in their interior intended for suspending sectioned cartridges filled with carbide of calcium, which will be attacked from beneath by the water coming from a receiver F communicating with the base of the receiver G. (3) A drier B, supplied with a moveable bell, and an annular cylinder C, equally moveable and provided with holes. There are taps to include or exclude at one operation the drying device, and make the acetylene pass directly from the generator through the purifier. (4) An automatic water-feeding receiver formed by a chamber, divided into two compartments by a diaphragm. One of these compartments is closed at its top by a cover, which has fixed in it a syphon, as well as a pipe led from the safety

apparatus S. (5) The tap valve T is automatic or operated by hand at pleasure. The central tube serves as a seat for the valve arranged at pleasure horizontally or vertically. The characteristic of this system is that the valve, although closed, allows free circulation in the receiver of the acetylene produced by one or more generators in action, and *vice versâ*. (6) The safety apparatus S is based on the same principle as the safety-tap valve, except that the flexible film of caoutchouc in the safety tap is replaced in the safety apparatus S by a bell, moving in a mercury seal.

Treating Calcium Carbide for Use in Acetylene Generators.—Sartig, J., of Cassel, Germany. No. 10,763; May 11, 1898.

The object of this invention is to facilitate the flow or slip of calcium carbide when supplied to an acetylene generator, by preventing it sticking to the walls of the container.

The patentee attains this object by combining or incorporating with the carbide materials which will impart to it great facility to slip or slide. The materials found advantageous for this purpose are talc or lycopodium, "as they have no influence upon the water, nor are they in any way attacked by the gas generated, or by the water." The carbide is treated by grinding with it a suitable proportion of either of the above-named materials; or the "slippery material" may be applied by dusting or sprinkling it over the carbide. The percentage of materials will vary with the apparatus in which the carbide is to be used; but about 3 to 6 per cent. will be sufficient in most cases—a greater proportion will, of course, be required with apparatus in which the discharge outlet is only slightly inclined.

APPLICATIONS FOR LETTERS PATENT.

14,707.—Forbes, Sir C. S., "Acetylene generators." July 4.
14,713.—Lake, H. H., "Generating acetylene gas." A communication from La Compagnie Continentale D'Incandescence et de Chauffage. July 4.
14,722.—Wilson, T. C., "Gas cooking-stoves." July 4.
14,729.—Gastaldi, G., "Generating acetylene." July 4.
14,823.—Thompson, W. P., "Heating and ventilating systems." A communication from the American Incandescent Gas Company. July 5.
14,858.—Scarth, J. E., "Generation of acetylene gas." July 6.
14,874.—Lester, J., "Increasing the illuminating power of incandescent gas-light, and other artificial light-giving bodies." July 6.
14,891.—Glover, J. G., and Meacock, T., "Explosion engines." July 6.
14,919.—Praag, D. J. Van, "Neutralizing the smell of calcium carbide and acetylene gas." July 7.
14,972.—Cousin, H. E. A., "Production of acetylene gas." July 7.
14,995.—Brown, J. W., and Buckton, T. P., "Carburetters for use on gas and oil engines." July 8.
15,000.—Shannon, W., "Gas-iron." July 8.
15,001.—Ross, J. H., "Acetylene gas-lamps." July 8.
15,014.—Sutcliffe, H., "Acetylene gas generators." July 8.
15,020.—Henriquez, E., "Acetylene generating apparatus." July 8.
15,044.—Landi, T., "Gas-burners." July 8.
15,077.—Duncan, J. H. H., "Incandescence bodies suitable for use with gas and other burners." July 8.
15,083.—Simmance, J. F., and Abady, J., "Gas-regulators." July 9.
15,084.—Simmance, J. F., and Abady, J., "Water heating by gas." July 9.
15,139.—Buffington, L. S., "Acetylene or like generators and lamps." July 9.

The Industrial Position in New Zealand.—We have received from the Secretary of the Free Labour Protection Association (Mr. F. Millar) a letter on the above subject, giving some interesting particulars, extracted from the "New Zealand Herald" of the 9th ult., which show that labour legislation in that colony has done more harm than good. The following are some of the statements made by that paper: £5,654,000 increase in the National Debt, and contingent liability of £5,234,000; £342,000 per annum of increased taxation; an increase last year of 4s. per head of the entire population, with a certainty of a further increase this year; 453 more civil servants to provide for; 2800 more State paupers; and 17,400 unemployed. Mr. Millar asks: "Has the United Kingdom 1,000,000 unemployed—that is, as many in proportion to population as New Zealand; about 4000 fewer people placed in the land; a decrease of £2 4s. 8d. per head in imports and exports; a decrease in the development of the output of local industries of no less than £1,286,935 per annum?"

Mr. C. Sellers on the Future of Gas.—At the annual dinner of the employees of the York Gas Company, held at Scarborough, on the 9th inst., Mr. C. Sellers, the Engineer and Secretary, in proposing "Prosperity to the Company they served," referred to the fact that they were face to face with the electric light as a competitor for lighting purposes in York; the Corporation intending to run it on their own account. But nobody who knew anything about the two systems of lighting would, he said, "turn a hair" in his confidence in gas, which had had competitors since it was first ushered into existence. It had competed with candles of tallow and candles of wax; and it had competed with oil-lamps of every variety. But all its competitors had had to "take back seats." From being in its early history only used for lighting, gas had now become—from the great advantages it conferred upon society for cooking and warming and a variety of trade purposes—a real necessity of domestic and commercial life. In these respects its future was assured. All the experience in other great centres of population where gas had been face to face with the electric light amply confirmed these views. The future of gas, too, as a lighting medium, was assured from its growing cheapness, and from its amenability to further scientific developments, the most recent of which was a new burner, the most economical and the most efficient in light-giving power that had ever been invented. Lastly, the future of gas was assured by its growing use as a fuel, which was daily realizing the prediction that gas would be "the fuel of the future." Mr. Sellers added: "We, then, as workers, need have no fear for our industry, while those who have put their money in gas securities may sleep calmly and confidently upon their investments; for if there is a security which in all human probability will weather all financial storms, that security is gas."

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Sulphate of Ammonia Committee.

Sir,—In your last issue you published the report of the above Committee for the year ending the 30th of June. The work accomplished during the year is eminently satisfactory as a commencement, though much of the educational portion—the result of the extensive issue of suitable literature upon the subject of chemical manures—cannot possibly be tabulated. Such information will undoubtedly tell favourably in course of time, though it is unlikely that immediate results will be apparent.

The prizes offered by the Committee have given an interest to the subject that could not otherwise have been secured. Practical interest, in place of apathy and indifference, can only be assured by the hearty and continued allegiance of those who are concerned in the manufacture of sulphate. Now that the utility of the organization has been clearly demonstrated, it behoves manufacturers (especially those in connection with gas-works) who have not united in the movement, to add the weight of their influence to those already engaged, by becoming subscribers and supporters of that which has so desirable an object in view—namely, the placing of sulphate in its legitimate position in the agricultural world.

On numerous occasions you have, through the "Journal," urged the due recognition of the claim of sulphate as a chemical manure, and have also given valuable recipes of the best mixtures for different kinds of soil and crops. Pioneer work is incomplete without the subsequent stages of development. These can only be obtained by careful experiment, which fortunately, through the stimulus of the prizes offered by the Committee, will be forthcoming in due course. The successful experiments made on Lord Rosebery's Dalmeny Park Estate are being confirmed many times over. Much remains to be effected to reduce the exportation of sulphate to a minimum. Of late much has been said concerning the waste products in connection with many manufactures; and the subject has been largely applied to gas-works. It is felt by many that, in the matter of allowing inferior manures to be imported, and sulphate exported, there is considerable waste occurring. It is certainly a subject of the first importance.

Recently I suggested (or, more correctly, re-suggested) the advertising of sulphate of ammonia under a new name—that of "nhitros;" but it was deemed inadvisable to alter the present one. Although it would perhaps be a mistake to do so, yet "sulphate of ammonia" appears to be too long a title for ordinary use; and I think the word "sulphate" might advantageously be adopted.

The 500-guinea prize for the best essay on "The Utility of Sulphate of Ammonia in Agriculture" will engage the thoughts of many chemists and agriculturists. It is probable that, with such a concentration of ability, new ideas and methods will be the outcome. At all events, it is a wise venture on the part of the Committee.

Huddersfield, July 15, 1898. E. A. Harman.

The Price Realized for Retort-Oven Tar.

Sir,—In your issue of the 28th ult., you criticize a paper I read before the Iron and Steel Institute, and say the price I put down for tar—viz., 17s. per ton—is 30 per cent. too high. You will notice that I qualified this statement by saying that these prices were necessarily subject to market fluctuations. I am offered at the present time more than 17s. per ton at the works for the whole of my make of tar. Your statement, therefore, is hardly correct.

Brymbo, near Wrexham, July 12, 1898. John H. Darby.

Meeting Extraordinary Claims Out of Reserve Funds.

Sir,—Has a legal definition ever been given of the words "extraordinary claim or demand" in Section 31 of the Gas-Works Clauses Act, 1847. I see in a case referred to on p. 104 of the last number of the "Journal" that they have been applied to "constructing an additional main," the details as to which are not given. This may be a legitimate application of the reserve fund, when the Company's capital is fully paid up. But if the clause can invariably be so interpreted, it will afford an easy way of enabling extensions, properly chargeable to capital, to be paid for indirectly out of profits, because sums so drawn from the reserve are immediately replaceable out of current profit, which comes to the same thing as charging the cost direct to profits. To companies who are earning more than their statutory dividends, and do not wish to increase their paid-up capital, the system would be very acceptable.

July 14, 1898. Inquirer.

The Bandsept and Kern Burners.

Sir,—In the "Journal" for the 28th ult., there appeared a letter signed "Technologist," in which Bandsept's and Kern's patents were mentioned; and it was stated that Kern had anticipated Bandsept. I have looked into the matter, and enclose a few particulars in regard to M. Bandsept's patents. Far from Kern anticipating Bandsept, the latter obtained in Belgium patents for the application of the injector principle, with mixing cones covered by an atomizer, in 1894, and the improvement of the patent of April 19, 1895, masters the Langhans patent, since the international convention grants a time of seven months for filing the English patents.

The following are the dates of patents: Bandsept (England), April 19, 1895; do. (Belgium), Sept. 25, 1895; Langhans, June 14, 1895; Kern, Jan. 5, 1897.

28, *Victoria Street, S.W., July* 8, 1898. C. E. Masterman.

[Enclosure.]

RECAPITULATION OF A. BANDSEPT'S BURNER PATENTS.

Specification.

Nov. 4, 1892.—*Improvement* (*No.* 101,983) *to Patent of July* 7, 1892.

Apparatus for utilizing the intense heat obtained by the combustion of intimate mixtures of air and gas. Static and dynamical mixers, the first based on the principle of the injector acting by the lateral drag of one of the fluids and subsequent pulverization of the mixture. Progressive division

of the gaseous mass forced through chicanes; zigzags rendering the mixture intimate.

March 18, 1893.—*Improvement* (*No.* 103,894).

By ultimate mingling obtained from the three effects, superficial shock in bulk, multiple friction by jets, and molecular laminating, the mixture acquires sufficient homogeneity and stability to give out the greatest sum of chemical reactions in a given space of time.

May 1, 1894.—*Invention* (*No.* 109,748).

Self-Mingling Burners.—Combustion of an intimate and perfectly proportioned mixture of air and gas. Theoretical mixtures conveyed in a nascent state into the flame; the latter becoming chemically solid, and giving rise to calorific effects as powerful as those obtained from blowpipes. Proof of self-burning mixtures by burning them under the surface of water without any other supply of air. Disposition of a self-mingling burner on ordinary gas pressure, composed of an injector entering a conical tuyere surmounted by an expanding tube which is provided with an atomizer; the latter leaving at the top of the burner an annular space covered by a screen of inclined slits. Hollow plugs, through the winding passages of which the mixture is obliged to force its way, act as atomizers; the latter having a perforated crown.

Dec. 8, 1894.—*Improvement* (*No.* 113,105).

Atomizing of perfectly proportioned mixtures, renewed at the moment of their utilization. Homogeneous and isothermic flames. Absolute utilization of the heat; units disengaged by perfect combustion. Injector with tapered hole inducing a double action, and working in combination with wire gauze partitions at the top of the burner, so arranged as to expel the mixture with sufficient force to cause it to pass through this atomizing structure, according to the speed of the flame. Possibility of adapting to the flames so produced stronger mantles than those in use up to the present.

April 19, 1895.—*Improvement* (*No.* 115,137).

Dispositions of atomizers and injectors producing chemically homogeneous flames at the highest temperatures. Combination of the injector and atomizer; the latter opposing a certain resistance to the passage of the gases. The whole injector is combined so as to increase the velocity of the issuing jet, and then propel the mixture by progressive dilatation. Thus the two essential parts of the self-mixing burners react usefully one on the other.

June 28, 1895.—*Improvement* (*No.* 116,306).

Proportions in full size of self-mingling burners specially composed of an injector having a central gas passage tapering to a fine jet orifice, working in a conical frustum surmounted by a divergent approximately double in length, and provided at its extremity with trellis or wire gauze for the purpose of atomizing.

May 5, 1895.—*Improvement* (*No.* 121,183).

Application of self-mingling and atomizing burners to combustion in water for the purpose of air and gas under pressure. Utilization of these burners in order to ascertain the temperatures furnished by the combustion of gaseous mixtures.

July 29, 1895.—*Invention* (*No.* 116,746).

Self-Mingling and Atomizing Burners.—Recall of the fixed (or moveable) organs at the top of the burners. Injector with superposed tuyeres in order to first lay the gaseous vein and afterwards relieve it so that the column gradually expends as it rises in the burner and saturates with air. At the top, inclined wire gauze, screen of slits, &c., as static atomizer; small rotating wheel as dynamical device.

May 6, 1896.—*Improvement* (*No.* 121,203).

Self-commingling burners for flat flames, especially with large surface; new kind of incandescent bodies being made out of thread, fillet, small bands.

May 26, 1895.—*Improvement* (*No.* 121,578).

Form and special proportions of the self-commingling burner.

Nov. 7, 1895.—*Invention* (*No.* 118,225).

Atmospheric Burner.—Injector with tapered hole and air inlet at the base of a conical profile followed by a divergent cone of at least double the length, and with an angle not exceeding 10 degrees; the large part enclosing a plug of trellis, which pulverizes the mixture and conveys it laterally.

Dec. 5, 1896.—*Invention* (*No.* 124,988).

Device still Increasing the Speed of the Mixture.—Central gas passage tapered to a fine jet orifice, and around, at a lower level, other annulary jets which draw in air from openings made in the burner and pass with the air through a truncated conical tuyere, while the higher central jet increases the velocity of the mixture passing afterwards through an expanding tube. The top of the latter has a deflector forcing laterally the mixture, which issues through an annular screen.

Dec. 7, 1896.—*Improvement* (*No.* 125,007).

Other form of the special injector entering the convergent divergent mixing-tube provided with one or more air inlets, and receiving in its enlarged part a deflector placed between the wire gauze in order to convey the pulverized mixture laterally under the mantle. Two superposed air inlets arranged between two truncated cones, the upper one being wide open so that the second stream of air is directed towards the first mixture passing the narrow truncated cone.

July 2, 1897.—*Improvement* (*No.* 129,205).

A third admission of air under a different angle again is provided, enriching the theoretical mixture still more.

Aug. 30, 1897.—*Improvement* (*No.* 130,353).

Proportions and dimensions of practical burners with two and three air inlets disposed to check with the object of commingling when resistance is reduced at the top of the burner.

Sept. 25, 1897.—*Improvement* (*No.* 130,818).

Lengthening of the enlarged part in the mixing-tube; new disposition of the atomizer; helical plates.

Check to Wasting Natural Gas.—Owing to the reckless waste of natural gas in some of the districts supplied with this illuminant, proceedings have lately been taken against certain parties, but without effect, in a local Court in Indiana. The Supreme Court, however, has reversed the decision, and declared the waste illegal, as being against the general public good. According to "Cassier's Magazine," the waste of natural gas has been of the most reckless character; the vapour being in some cases burnt as a "flare" from the open ends of pipes, without burners.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Keighley Corporation Bill, Paignton Improvement Bill, St. Helens Corporation Bill.

Bills reported, with amendments: Clacton-on-Sea Gas and Water Bill, Gaslight and Coke Company Bill, Leyton Urban District Council Bill, Maldon Water Bill, Matlock Urban District Council Bill, Rhymney and Aber Valleys Gas and Water Bill, Southampton Gas Bill.

Bills read the third time and passed: Higham and Hundred of Hoo Water Bill, Matlock Urban District Council Bill, Tottenham and Edmonton Gas Bill.

The opposition to the Wey Valley Water Bill has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Gas Orders Confirmation Bill, Newcastle and Gateshead Water Bill, Rochdale Corporation Water Bill, Todmorden Corporation Water Bill.

Bills reported, with amendments: Felixstowe and Walton Water Bill, Newtown Water Bill, Paignton Improvement Bill, Tynemouth Corporation Water Bill.

Bills read the third time and passed: Bacup Corporation Water Bill, Halifax Corporation Bill, Keighley Corporation Bill, Liskeard Corporation (Water) Bill, Paignton Improvement Bill, St. Helens Corporation Bill, Stirling Gas Bill.

On Wednesday, Mr. Cohen asked the First Lord of the Treasury when it was proposed to constitute the Select Committee, ordered by resolution of the House on the 22nd ult., on the subject of the prices charged for gas by the various Gas Companies in the Metropolis. Mr. Balfour replied that he understood arrangements were being made for the early appointment of the Committee.

HOUSE OF LORDS COMMITTEE.

Wednesday, July 13.

(*Before Lord* Camperdown, *Chairman, Lord* De Saumarez, *Lord* Raglan, *Lord* Hare, *and Lord* Amherst of Hackney.)

THE GASLIGHT AND COKE COMPANY BILL.

This Bill, the object of which, as our readers are aware, is the conversion and consolidation of the capital of The Gaslight and Coke Company, came to-day before the above-named Committee. The only opposition to the Bill was on the part of the London County Council, who on their petition sought to raise the question of the price charged for gas by the Company to the consumers in North London, as compared with that of the South Metropolitan Gas Company in South London.

Mr. Pope, Q.C., Mr. Balfour Browne, Q.C., Mr. Claude Baggallay Q.C., and Mr. Danckwerts appeared for the promoters; Mr. Worsley Taylor, Q.C., and Mr. G. J. Talbot represented the London County Council.

Mr. Pope, explaining the objects of the Bill to the Committee, said the proposed conversion would make the stock a tangible and useful investment stock for small holders, readily realizable and marketable by them if they should so desire. By fixing the price to be charged for gas by the Company, and applying the sliding-scale in regard to dividends, Parliament had made the consumer the predominant partner with the Company in any economy secured in production. The sliding-scale had operated enormously to the advantage of the consumer, by cheapening gas. If the price was raised, the Company were obliged to decrease their dividend; if the price was lowered, they could increase the dividend above the 10 per cent. fixed in their Bill. The Gaslight and Coke Company, with a standard price of 3s. 9d. per 1000 cubic feet, were now charging 3s.; and their last dividend was at the rate of 12¾ per cent. Before the Company were compelled to increase their price to 3s. per 1000 cubic feet, and thereby come under the penalty of a smaller dividend imposed by the sliding-scale, their stocks stood in the market at £312; they now stood at about £275—the difference probably representing the public estimate of the effect of the increased price of gas. Anybody who went into the market and bought £100 of stock, therefore, had to pay, roughly, about £300 for it. It was almost unintelligible to the small investor—whom especially it was desirable to encourage to become a holder in gas undertakings—that, after paying £300, he received a certificate for only £100 of stock. The whole object of the Bill was to convert the stock, by exactly correlative and absolutely proportionate conversion, into one bearing a lower rate of dividend, and therefore commanding a smaller proportionate price in the market. There were at present fifteen different descriptions of the Company's stock on the market. It was proposed to convert these into three stocks and a debenture stock—a 4 per cent. consolidated preference stock, a 3½ per cent. maximum stock, and a 4 per cent. ordinary stock; the consolidated debenture stock bearing 3 per cent. interest. The operation of the sliding-scale would remain unaltered; and the position of the consumer would not be affected one atom. Dealing with the petition, Counsel said the proposed conversion would have no effect on the purchase price of the undertaking, as alleged by the County Council; and he argued that the same relief which had been given to the South Metropolitan Gas Company by their Act of 1896 should be extended to the nearly £12,000,000 capital of The Gaslight and Coke Company. The conversion would to a certain extent be an advantage to the shareholder, because, instead of an unmarketable and high-priced security, it would give him a more marketable and easily disposable property at a lower price and bearing a lower rate of dividend.

The County Council said it would be so much to the advantage of the shareholders that Parliament ought not to give them the advantage unless they in some way bought it. But the question the promoters put before the Committee was how far it was possible or right that they should interfere in this purely domestic matter, to compel the Company to pay the consumer for something which did not do him any harm or affect his interests in any way. Counsel went on to recite precedents, notably the South Metropolitan Gas Act of 1896, which he argued was based on the same principles, and received the sanction of Parliament.

Mr. *John W. Field*, Secretary and General Manager of the Company, gave evidence as to the capital of the Company, and details as to the manner in which the capital of the various Companies which had been amalgamated with The Gaslight and Coke Company was represented in the existing stock. The Victoria Docks Gas Company (purchased by agreement) involved a capital of £100,000; and there was allotted £100,000 of "A" ordinary stock. The City of London Gas Company had a capital of £400,000; and, owing to exceptional circumstances, the holders were allotted £300,000 of "A" ordinary stock, and £100,000 of "B" 4 per cent. maximum stock. The Western Gaslight Company, with a capital of £600,000, received £600,000 "A" ordinary stock. The Imperial Gas Company, with a capital of £1,560,000, were allotted a like amount of "A" ordinary stock. The Great Central Company, which had a capital of £200,000, by reason of their exceptional position, received £200,000 of 10 per cent. preference stock. The Equitable Company had a capital of £300,000; and for similar reasons they obtained a like amount of 10 per cent. preference stock. The Independent Company, with a capital of £255,000 in various classes of stock, received £165,000 of 10 per cent., £30,000 of 5 per cent., and £60,000 of 7½ per cent. preference stock. Two other amounts of the Imperial Gas Company's capital, of £325,000 and £975,000, received like amounts of 7 per cent. maximum stock. In the latest amalgamation—that of the London Gas Company—£544,000 of capital received £394,000 of 10 per cent., and £150,000 of 6 per cent. preference stock; £26,000 received £26,000 of 6 per cent. preference stock, and £369,000 received 6 per cent. preference stock as regarded £300,000, while the remaining £69,000 received £69,000 of 10 per cent. preference stock. The interest on the substituted capital would be exactly as at present—namely, £151,989 10s.—the debenture stock being converted into 3 per cent. consolidated debenture stock.

Cross-examined by Mr. Worsley Taylor, witness said there were 280,000 consumers. The Company wanted to get rid of the anomaly of being charged with having a 12½ per cent. stock, when really the investor buying shares under the auction clauses only received 4 per cent., and to render their capital account less cumbrous. It was, in his opinion, doubtful whether the conversion would enhance the market value of the stock. If it should, the present holder would have the advantage, and not the buyer.

The cross-examination taking the line of a comparison between The Gaslight and Coke Company and South Metropolitan Gas Company,

The Chairman said that whatever reductions of price the two Companies had made, both of them were acting under statutory conditions, which neither had infringed.

Mr. Worsley Taylor agreed; but he argued that The Gaslight and Coke Company were asking Parliament to do something entirely in their favour. It was, therefore, a material fact to consider whether they had deserved it.

The Chairman: Did the South Metropolitan Company, in return for being permitted to convert their stock, confer any advantage on the public?

Mr. Worsley Taylor said they did not, because they had already conferred a benefit on the public by reducing their price. If The Gaslight and Coke Company said they had done as well as the South Metropolitan had done for their consumers, then he admitted there was a precedent; but he contended that in this case there was not.

The Chairman: Obviously the reason why the South Metropolitan Company made the reduction was to increase their dividend; and they did that before they came to convert. It was not because they were allowed to convert that they did anything.

Mr. Worsley Taylor said his point was that there had not been the same due care in the management of The Gaslight and Coke Company which existed in the case of the South Metropolitan Company, which entitled them to ask Parliament to vary the terms of the bargain made between themselves and the consumers.

The Chairman: What that has got to do with the present Bill beats me altogether. I quite understand that the conversion might increase the market value of their stock; but so long as the Company are complying with their statutory conditions and keeping within their statutory limits, I do not see how we can interfere. Do you wish this tribunal to decide whether The Gaslight and Coke Company have conducted their business in an economical way or not? In other words, are we to go back and alter their statutory conditions?

Mr. Worsley Taylor: Yes, if they seek to have the statutory conditions altered. If they ask your Lordships to revise the statutory conditions in their favour, we ask you to consider our side of the question. The Company wish to be allowed to put £1,800,000, or thereabouts, into their pockets. The only opportunity the consumers have of getting their grievances redressed is when the Company come to Parliament for fresh powers. The Board of Trade could do nothing when approached by the London County Council. We shall seek to show by our witnesses that, if the Company had conducted their business properly, there would have been a reduction in the price of gas. I shall have very great difficulty in putting my case before your Lordships, unless I am allowed to go into the past conduct of the Company.

Witness having been further cross-examined on this question,

Mr. Pope said he would concede the point that the results were not as good on the North of the Thames as they were on the South; but this was owing to different circumstances.

Re-examined by Mr. Balfour Browne, witness said that for the purpose of any fair comparison between the South Metropolitan and The Gaslight and Coke Companies, all the circumstances of the two undertakings must be taken into account. Among other things, The Gaslight and Coke Company were in keener competition with Electric Lighting Companies than any other Gas Company in existence; while the South Metropolitan Company had little of such competition.

In reply to the Chairman, witness said he did not know any instance where splitting a stock had not been followed by a rise in its market value; but he could not trace any increase directly attributable to the splitting of stock. In the other House, he submitted a comparison which led him to the conclusion that the increased market price was rather the effect of other causes than stock splitting. His comparison showed that the number of years' purchase had increased in practically the same ratio in the case of Companies where there had been no conversion as in that of Companies where there had been conversion. Personally, he saw no objection to a stipulation being inserted in the Bill that the purchase price should not be based on the market value of the stock.

Mr. *H. E. Haward*, Comptroller to the London County Council, said he thought the proposed conversion would enhance the saleable value of the stock. This had appeared to him to be the sole object of the promoters. It would make the stock more marketable, and therefore increase its price. Taking all the stocks, he estimated the added saleable value would amount to nearly £1,800,000. He gave figures to show that the market price of converted stocks had increased in greater ratio than that of unconverted stocks; and he expressed the opinion that the Stock Exchange value would indirectly affect the award of an arbitrator when fixing the purchase price. Nearly every District Board north of the River Thames had sent in resolutions asking the County Council to oppose the Bill. Under the existing statutes, there was no method of revising the price of gas except when the Company came to Parliament for further powers. The majority on the Council in favour of opposing the Bill was 100 to 4.

Cross-examined by Mr. Balfour Browne, witness said the Council thought the conversion would be a valuable concession granted to the shareholders, and that the consumers ought to get some benefit. It would be a most improper thing for the Stock Exchange value to be considered by an arbitrator.

Mr. Balfour Browne said he had never heard of such a thing being done. He should strongly object to a clause being inserted that the market price of the stock was not to be taken into consideration in the event of the sale of the undertaking hereafter, because he did not wish it to be indicated that there was to be such a sale.

Further cross-examined, witness admitted that all undertakings were properly sold upon the maintainable profit.

In answer to the Chairman, witness said the insertion of such a clause as suggested by him would not meet all the objections of the County Council. The Council felt the conversion was going to be a substantial benefit to the shareholders, and that in return the Company should give the consumers something—especially as the consumers, as they thought, had suffered from the way in which the Company had been managed. Personally, however, he would like to see the clause inserted, as it would be a valuable precedent, which might be used not only against the Gas Companies, but also against the Water Companies.

Mr. Talbot, in addressing the Committee, said the case of the London County Council had been so well put by the last witness that he need only summarize the points. The first object of the Bill was to disguise the fact of the high dividend paid; and though it would not be paid in immediate return to a purchaser, it was a dividend upon the original stock, and this remained. The other object of the Bill was to enhance the market value of the stock for the benefit of existing shareholders. The County Council were prepared to lay before their Lordships figures showing the grave differences in the price charged for gas and in the capitalization of the Company, which differentiated it from every other Company, and particularly from the South Metropolitan Company. Though The Gaslight and Coke Company were bound to keep below their standard, the price was unduly high. The conversion would confer no corresponding benefit upon the consumers; and on these grounds he asked their Lordships to reject the Bill till relief was promised to the consumers.

Mr. Balfour Browne, in reply, said it was very doubtful whether there would be any benefit from an enhanced market value.

The Chairman remarked that Mr. Field could not mention any instance where a rise had not followed a splitting of stock.

Mr. Balfour Browne (continuing) said there were a hundred circumstances to account for the greater prosperity of the South Metropolitan Company as compared with The Gaslight and Coke Company, who had had to draw very largely on their reserve fund to pay dividends. The only benefit in an improved market value would be to any isolated shareholder who was forced to sell his shares. Counsel ridiculed the idea of an arbitrator taking market value into consideration in fixing the purchase price of an undertaking. Besides "Bulling" and "Bearing," there might be "faked" sales to run up the price. He objected to the suggested Stock Exchange value clause, on the ground that the petitioners might, in coming with a Bill for purchase, say Parliament in 1898 was anticipating purchase, and by the insertion of this clause had therefore practically decided the question. Mr. Haward wanted the clause for the purpose of putting pressure on the Water Companies; but the financial aspect of the purchase of Water Companies was now under consideration by a Royal Commission. He asked the Committee to consider the Bill as a conversion Bill, and nothing else.

After a short deliberation,

The Chairman said the Committee decided that the Bill might proceed, but with the insertion of a clause to provide that the effect of conversion should not inure to the disadvantage of the public in the event of purchase taking place hereafter.

The following clause was then submitted to, and accepted by, the Committee:—

"*Provision in event of Purchase of Company's Undertaking by Public or Local Authority.*—"Whereas the conversion by this Act authorized may affect the market prices of the Company's stocks, therefore be it enacted that, in the event of any purchase of the Company's undertaking by a Public or Local Authority, the market prices of the Company's stocks shall not be taken into consideration in determining the price to be paid for the said undertaking."

RHYMNEY AND ABER VALLEYS GAS AND WATER BILL.

At an earlier stage of their proceedings, the Committee as originally constituted, under the chairmanship of Lord Clinton, had before them the above-named Bill. Its object is to incorporate a Company to acquire the undertakings of the Rhymney Valley and some other Gas and Water

Companies, construct gas-works, and supply gas and water within certain prescribed limits.

The Bill had already been considered by a Select Committee of the House of Commons in April last, and passed. It was now opposed by the Rhymney Iron Company and the Merthyr District Council. The *locus standi* of the latter, however, was disallowed; and an offer had been made to supply the former with 480,000 gallons of water as compensation for any taken.

The Chairman of the Company (Sir H. Tylor) was called and stated that they had expended about £20,000 on the water-works. The Company did not oppose the Bill in the other House, as they hoped negotiations then in progress would have proved satisfactory. He was willing to sell the undertaking, but did not think arbitration terms were reasonable. The General Manager of the Company (Mr. Smith) said he did not object to the amount—480,000 gallons—of compensation water during the dry months of the year; but he did not believe they could get it. They would not be satisfied with money compensation—nothing but compensation water. Mr. G. F. Deacon and Mr. R. E. Middleton stated that 216,000 gallons of water in dry weather would flow down the stream.

In the end, an agreement was entered into somewhat in the following terms: When only 25,000 gallons of water are coming down the stream, the promoters are not to take any—the Iron Company are to have it all; the compensation water is to be the first charge; and the promoters are to purchase the Iron Company's works, the purchase to be deemed compulsory under the Lands Clauses Act. The Bill was then allowed to proceed; clauses being subsequently arranged. A new clause was brought up providing for the purchase of the Iron Company's works by the promoters, by agreement or arbitration. In another clause, provision was made as follows: Until the completion of the purchase, the Company shall not supply water within the limits of the Rhymney Urban District Council, nor shall they interfere with the waters of the River Rhymney or the Pitgwenllt Brook. A clause was inserted providing that the Company shall for ever maintain a suitable gauge for measuring the 25,000 gallons of water which the promoters bound themselves to supply to the Iron Company as water for the feeder, and in respect of any failure to maintain it a forfeit of £10 was imposed for every day upon which the specified quantity of water was not available. The subject of compensation water was next dealt with; a request being made that the promoters should only be required to send it down on the working days of the week, as it would run to waste and do nobody any good. The Committee decided that the supply should not be limited to six days, and that the whole of the 480,000 gallons should be taken from No. 2 reservoir instead of from No. 1.

These requirements having been carried out in clauses, the Bill was allowed to proceed.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, July 8.

(*Before Justice* KEKEWICH.)

Southwark and Vauxhall Water Company v. Wandsworth District Board of Works—Water-Mains and the Alteration of Street Levels.

This was a motion by the plaintiffs for an interim injunction to restrain the defendants from lowering their streets and footways wherever the plaintiffs' pipes and mains were laid, in any manner which would leave such pipes or mains without a sufficient covering of soil or other material to protect them from injury—whether by the passing of traffic, the effect of frost, or otherwise—unless the defendants should first alter the position of the pipes and mains by placing them at a depth below the proposed new surface of such streets or footways, not being less than the depth at which the same then were below the present surface of such streets or footways. It appeared that the defendants contemplated lowering some of their footpaths to such an extent as to leave only a few inches of surface above the plaintiffs' mains. This the defendants maintained they were entitled to do; and they contended that if the mains, for their protection from frost or otherwise, had to be lowered to a proportionate depth, this should certainly have been done by plaintiffs at their own expense.

Mr. WARRINGTON, Q.C. (Mr. GORE BROWNE with him), for the plaintiffs, referred to section 98 of the Metropolis Local Management Act, 1855, which empowers a District Board to pave and repair streets, "and to cause the ground or soil thereof to be raised or lowered . . . and to alter the position of any mains or pipes in or under any such street; such alteration to be made subject to the approval of the Engineer of the Company to which such mains or pipes belong." They contended that if the defendants exercised their power of altering the level of a street, they must exercise their other power of altering the position of the mains; and that the defendants were not to exercise their powers in such a way as to be injurious to the plaintiffs. All the plaintiffs asked was that the mains should be made as safe as they had been—that is, laid at the same depth as before.

Mr. RENSHAW, Q.C., with whom was Mr. LYTTELTON CHUBB, on behalf of the defendants, contended that the motion was misconceived—that it sought to compel the defendants to do that which if they did not do would be negligence on their part, and so give rise to a claim for damages. But it had been laid down that turnpike trustees and other public bodies exercising their parliamentary powers were not liable for consequent injury arising therefrom.

Justice KEKEWICH said the Court had a large power in granting an injunction, and he thought this was the exact case in which that power should be exercised, rather than that the Court should wait until the injury was done and leave the plaintiffs to apply for damages. They were therefore entitled to an injunction, though the form asked was too wide. The proper form would be to restrain defendants from altering the location of plaintiffs' mains by placing them in a position in which they would be more liable to injury than they were at present.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Saturday, July 2.

(*Before Justices* RIDLEY *and* PHILLIMORE.)

Mayor and Corporation of Liverpool v. Overseers of Llanwddyn—The Rating of the Liverpool Water-Works.

This was a special case stated by the Justices of Montgomeryshire, who, in October last year, had before them an appeal by the Liverpool Corporation against the assessment of their water-works by the Assessment Committee of the Llanfyllin Union. The proceedings on that occasion were reported in the "JOURNAL" for Oct. 26, 1897 (p. 903).

Mr. BALFOUR BROWNE, Q.C., and Mr. E. H. LLOYD appeared for the appellants; Mr. F. MARSHALL, Q.C., Mr. ELLIS J. GRIFFITH, M.P., and Mr. T. A. HERBERT represented the respondents.

The special case set forth that, at the Montgomeryshire Quarter Sessions, on the 5th and 21st of October, 1897, an appeal by the Corporation of Liverpool against a certain rate or assessment, purporting to be a rate made for the relief of the poor and other purposes in and for the parish of Llanwddyn, on the ground that they were over-assessed for the premises in their occupation, and upon other grounds, was heard, with the result that the Justices confirmed the rate, and ordered the appellants to pay the costs. The appellants being dissatisfied, the Justices stated a case for the opinion of the High Court. The facts were that on Dec. 1, 1896, the appellants were the occupiers of certain works and premises in the parish of Llanwddyn and other parishes in Montgomeryshire, consisting of a reservoir, embankment, tunnel, and other incidental works, forming part of their water-works. The works were described in the valuation list as of a gross rental of £19,500, and a rateable value of £15,322. In December, 1896, the Overseers of Llanwddyn made a rate of 8½d., and the appellants were charged with this rate upon the net assessment of £15,322 in and for the sum of £542 13s. 1d. The appellants objected before the Assessment Committee of the Llanfyllin Union to the rate and assessment; but the Committee confirmed the rate, and the appellants then appealed to the Quarter Sessions, where it was shown that the cost of the structure of the dam and reservoir in the respondent parish was £646,932, and that the cost of the land upon which the works were constructed was £62,250. The appellants also had, in addition to those amounts, expended on bridges, £8337; on roads, £55,939; on a church, vicarage, and schools in substitution for the buildings which were submerged by the formation of the Vyrnwy reservoir, £13,952. Not any of those hereditaments were, however, now in the occupation of the appellants; but they were provided and constructed by them pursuant to obligations imposed by the Liverpool Corporation Water Works Act, 1880. The reservoir was at present large enough to deliver a daily supply of 52½ million gallons; but the catchment area with which it was connected was only sufficient to provide a daily supply of 41 million gallons. Certain other catchment areas were, however, in the possession of the appellants, and could be connected with the reservoir; and when this was done an additional daily supply of 11½ million gallons would be given. Of that supply, 39 million gallons would be delivered by means of three pipes to Liverpool, and 13½ million gallons would be passed away down the River Vyrnwy as compensation water. At present, of the three lines of pipes which were ultimately destined to form the aqueduct, only one, capable of carrying 13 million gallons of water to Liverpool had been laid. The appellants were in 1896, and had since been, able to borrow money for the purposes of their water-works at from £2 10s. 11d. to £2 11s. 10d. per cent.; but for the Vyrnwy works £1,845,841 of capital was borrowed at 3½ per cent. per annum, and £104,528 at 2¾ per cent. The last-mentioned rates of interest were still paid thereon, the money having been borrowed between 1880 and 1889. According to the valuation put in by the appellants, the structural cost of the reservoir works in the respondent parish was £646,932; and the cost of land (1245 acres, at £50 an acre) £62,250—making the total capital cost of reservoir and site £709,182. But as only a portion of the works were in the parish, they put the capital cost there at £617,450. The lake, they said, was now producing only 26,506,850 gallons per day, instead of 52,506,850 gallons, or about one-half, so that the effective capital value, according to the appellants' valuation of the reservoir and site in the parish, would be reduced to £308,725. Then adding the value of the tunnel works in the parish, £9312 (allowing for the fact that only one pipe is laid), and putting the present effective capital value of the works at 2¾ per cent., the appellants' valuation brings out the net rateable value of the works in the parish at £8746. Mr. William Marshall also put in a detailed valuation, bringing out the net rateable value at £16,920. It was contended on the part of the appellants that, for the purpose of ascertaining the effective capital value of the undertaking, the amount expended by them on bridges and roads under the compulsory provisions contained in their Acts should not be included; and that, inasmuch as the reservoir itself was now complete, and was capable of dealing with a daily quantity of 52½ million gallons, and that as the daily quantity which was at present required and delivered from the reservoir was only 26½ million gallons, the effective capital value of the reservoir and site was a 26½ : 52½ of the total expenditure thereon. Further, it was contended on behalf of the appellants that, in the circumstances set out by them, no higher rent ought to be fixed as the basis of assessment than an amount representing 2½ per cent. per annum upon the effective capital expenditure upon the undertaking.

On behalf of the respondents, it was contended that for the purpose of ascertaining the effective capital value of the undertaking in the respondent parish the expenditure by the appellants upon bridges and roads round the lake should be included, as enhancing the value of the lake; that as, in the present state of completion of the works, the reservoir could not be supplied from the various catchwater areas with more than 4 million gallons of water per day, the effective capital value of the reservoir was 26½ : 41 of the total capital expenditure; and that, as under the circumstances, a higher rent ought to be fixed as the basis of assessment than an amount representing 2½ per cent. per annum upon the effective capital expenditure in the parish, having regard to the fact that the Corporation of Liverpool were actually paying 3½ per cent. on the capital expended upon the works.

The Justices submitted the following questions for the opinion of the High Court: (1) Whether we were, for the purpose of ascertaining the rateable value of the reservoir and works, bound to treat such reservoir and works as integral parts of appellants' water undertaking, or whether we were entitled to treat such reservoir and works as severable from the rest of the appellants' undertaking. (2) Whether, if we were right in so holding we were also right in taking into account the other circumstances—the additional outlay which would be necessary in the construction of the works at the present time in consequence of growth of the population, the greater demand for such sites, and the increased cost of material and labour—in addition to the rate of interest at which the appellants could have borrowed money at the date of the making of the rate. (3) Whether, in order to ascertain the effective capital value of the appellants' undertaking, the amounts expended by them on roads, bridges, church, vicarage, and schools, or any and which of them, ought or ought not to be included. (4) Whether the effective capital value of the appellants' reservoir and site ought to be taken as 26½ : 41 or as 26½ : 52½ of the total capital expenditure thereon. (5) Whether the rateable value of the appellants' undertaking ought to be taken at 3 per cent. or 2½ per cent. per annum on the effective capital value of the undertaking.

Mr. Balfour Browne, in supporting the contentions made on behalf of the appellants before the Justices, argued, with regard to the rental value of the undertaking, that it ought to be based upon the percentage from which the capital expenditure could now be raised by the Corporation, which was 2¾ per cent. As to the bridges and roads, their construction was forced upon the Corporation in lieu of roads which they had destroyed. But they were public roads and bridges in the hands of the public authorities; and the increased accommodation which they gave had enhanced the value of the land in the neighbourhood, so that the respondents were receiving benefit from them in that way. He submitted, therefore, that the outlay upon them could not be included in the capital expenditure upon the works for the purpose of forming a rating basis. The learned Counsel was proceeding to deal with the question of the church, vicarage, &c., when

Mr. Justice Ridley intimated that he need not trouble himself upon that point.

Mr. Balfour Browne proceeded to contend that the Justices had gone upon a wrong principle in the valuation; that there could be no extra demand, and no growth of population in the watershed in question because the Corporation had purchased it all; and that the effective capital value ought to be taken for present rating purposes at only half the reservoir capacity, because this was, in fact, the proportion which was being utilized.

Mr. Marshall put his case higher than the Justices or the respondents had put it, for he said that, as a fact, the whole capacity of the reservoir was being utilized every day. It was constantly full; and as the respondents would be entitled to take into account the whole 52½ million gallons which it held, they were dealing liberally with the appellants in only putting the figure at 41. As to the interest, the respondents' Valuer put it at 3½, and the appellants' in the first instance at 2¾. It therefore seemed to him that the Justices fixing 3 per cent. as the basis were acting very reasonably. The learned Counsel argued that the roads and bridges were for the accommodation of the appellants; that they could not do without them; and that therefore their outlay ought to be included. When he went on to deal with the church, vicarage, &c.,

Justice Ridley (interposing) said the thing was ridiculous.

Mr. Marshall did not pursue the matter any further, but argued that the questions at issue were facts for the Justices, and that no questions of law were involved.

Mr. Balfour Browne having replied,

Their Lordships reserved judgment.

Friday, July 8.

Justice Ridley this morning delivered the reserved judgment of the Court. Having referred to the facts set out in the case, he said the appellants and respondents had adopted in principle the same method of arriving at the rateable value of the property; but, in carrying out the principle the differences arose which required, the Court's decision. The Quarter Sessions had submitted five questions. The first was whether the reservoir and works were to be treated as integral parts of the appellants' water undertaking, or as severable from the rest of the undertaking. The Court thought that such part of the water-works as lay within the parish was a separate rateable hereditament in it, and should be rated accordingly upon an estimate of the rent which it would yield after making the statutory deductions. (See *Reg. v. West Middlesex Water Company.**) But it must be taken that the reservoir and works were part of the whole undertaking for the purpose of distributing water as a source of profit; and though they did not directly earn anything in the parish, yet they conduced to earnings elsewhere. The whole undertaking continued in operation, and therefore the owner of the whole must be assumed to pay a contractor adequate remuneration for land and fixed capital vested in these parts of the undertaking, and for the labour and skill required for their construction and maintenance. The contractor stood in the relation of occupying tenant, in the words of the case cited: "The part within the parish is the rateable subject, and the local rateable value is such sum as will pay the rent of the land and the profit on fixed capital therein." The answer, therefore, was that the reservoir and works were integral portions of the undertaking, and, though rateable separately, were not to be valued apart from the rest of the undertaking. The second question was whether there ought to be taken into account the circumstances mentioned in paragraph 24 of the case, in addition to the rate of interest at which the appellants could have borrowed money at the date of making the rate. The Court, in the absence of direct evidence, could not feel certain that the supposed greater demand for sites existed, and that in this case the capital value should be arrived at from the cost of the works as a basis. The third question was whether, in order to ascertain the effective capital value of the undertaking, the amount expended on roads, bridges, church, &c., ought to be included. The Court were clearly of opinion that none of them ought to be included. It had been argued that the amounts expended were part of the cost of the works. It was clear, however, that they were not, but that they were to be regarded as expenses to which the appellants had been put in carrying out the obligations imposed upon them by Parliament. If they enhanced the value of the lands, as to which there was not sufficient evidence, this must be taken into account in the rateable value of the lands enhanced. The fourth question was as to whether the value of the reservoir and site ought to be as 26½ : 41 or as 26½ : 52½ of the total capital expenditure. At present, the daily supply was only about one-half of the complete or total possible supply. *Primâ facie*, therefore, the effective capital value was also one-half of the total. But, on behalf of the respondents, it was said that the total now received into the reservoir being only 41 million gallons a day, and the total supply being 26½ millions a day, the proper fraction to be used in the calculations was 26½ : 41. In other words, though the supply was only one-half of the intended amount, the rateable value of the effective capital was to be taken at more than one-half. It was also contended that the appellants should, in order to justify their contention, add to the capital value the cost of including the additonal catchment area which was required to bring the daily supply into the reservoir to the amount of 52½ million gallons. But it was the reservoir and works which were here rated, not the works which had not been carried out; and, though it was true that the proportion between the number of gallons supplied out of the reservoir and those actually received into it was at the time as 26½ : 41, this proportion did not represent the true relation between the effective capital value and the total cost of construction. The reservoir was large enough to receive 52½ million gallons daily, and had been constructed and completed for these dimensions. But it did actually only supply one-half of this quantity. For the purpose of the rate, the Court thought that the comparison supplied the true proportion. The case of *Reg. v. South Staffordshire Water-Works Company** was relied upon as showing that the cost of connecting the additional catchment area with the reservoir ought to be added to the capital value. But in that case the works had been completed and formed part of the undertaking. As to the last question—whether the rateable value ought to be taken at 3 per cent. or 2½ per cent. on the effective value of the undertaking—this was largely a question of fact, as to which the Court would not interfere with the decision of Quarter Sessions. The principle on which the capital value was to be calculated had been stated. The Court thought the percentage upon it ought not to be higher than the necessary rate of interest at which the money could be borrowed. At the same time, when all the circumstances were considered, the Court could not say that the percentage had been wrongly fixed at 3 per cent., though it was higher than the rate at which the money could now be raised. The order of Quarter Sessions ought to be quashed, and the rate reduced in accordance with the opinion of the Court.

Mr. Marshall asked for leave to appeal, and that costs, which had been reserved by Quarter Sessions, should abide the event.

Mr. Lloyd said it was impossible now to say what the rate, as amended by their Lordships, would be. As far as he could judge from a hasty calculation, he should say that the amendments in the order of Quarter Sessions would have the effect of reducing the rateable value from £15,000 odd to about £10,000.

Justice Phillimore: You ought to agree to the figures to-day, and submit them to Master Mellor, so that they appear as part of the order of the Court.

Mr. Lloyd said this should be done; but as to the costs, he submitted that the appellants were entitled to have them.

Mr. Marshall thought the costs ought to abide the result; the Court of Appeal might, he said, vary their Lordships' order.

Justice Ridley: You insisted upon a wrong rate, and you ought to pay the costs here and at Quarter Sessions. If the Court of Appeal should vary the order, they can vary it also as to costs. The order will be that the costs of this Court and of the Court of Quarter Sessions be paid by the respondents.

Judgment was ordered to be entered for the appellants accordingly; and leave was granted to appeal. The order of the Court, however, will not be finally drawn up till the parties have agreed upon the figures.

* See "Journal," Vol. VIII., p. 104.

* See "Journal," Vol. XLVI., p. 1017.

The Ballynahinch Gas Explosion.

In the "Journal" for the 26th of April last we reported a case in which two men, named Hughes and Roy, sought to recover damages, laid at £100, from the Ballynahinch Gas Company, for personal injuries alleged to have been sustained by them through a gas explosion caused by the negligence of the Company's servants. The plaintiffs failed in, their action in the County Court; but they appealed against the decision, and the matter was tried at the Ulster Summer Assizes last week. The result was in the appellants' favour; judgment being given for £30 each, with costs, the expenses of the witnesses, and the doctors' fees.

A Small Fine for a Large Waste of Water.

At the Newcastle-under-Lyme County Police Court yesterday week, Mary Brindley was summoned as the owner of a number of houses at Cross Heath, Newcastle, for allowing the water of the Staffordshire Potteries Water Company to be wasted. Mr. D. K. Johnson, on behalf of the prosecutors, proved that a pipe supplying a number of houses had been running to waste from May 15 to June 9, though the attention of the owner's agent had been called to it. The estimated waste of water during the time was 214,000 gallons; representing a loss to the Company of £7. A fine of 40s. and costs was imposed.

Extensions at the Burton-on-Trent Gas and Electric Light Works.—The Burton-on-Trent Town Council last Wednesday authorized the Finance Committee to apply to the Local Government Board for permission to borrow £50,140 for the purchase of property and for extending the gas and electric light works.

MISCELLANEOUS NEWS.

THE GAS PROVISIONAL ORDERS OF THE SESSION.

The Board of Trade have issued memoranda stating the nature of the proposals contained in the Provisional Orders included in the two Gas Orders Confirmation Bills of the present session.

The first Bill contains Orders relating to Budleigh Salterton, Coatbridge, Great Marlow, King's Lynn, and Whitchurch. The first-named Order is to empower the Budleigh Salterton Gas Company, Limited, to maintain and continue gas-works, to construct additional works, and to manufacture and supply gas. The share capital is £13,000, consisting of £3000 of original and £10,000 of further capital; and £3250 may be raised by loan. The Order authorizes the sale of gas in bulk by agreement beyond the limits of supply, and fixes the maximum price to be charged for gas at 5s. per 1000 cubic feet, with power to the Board of Trade, after the expiration of three years, to alter the maximum price or to substitute a standard price with a sliding-scale of price and dividend. The Coatbridge Order is to authorize the Coatbridge Gas Company to raise additional capital not exceeding £20,000 by shares or stock, and £5000 by loan; and to fix the standard price of gas at 2s. 6d. per 1000 cubic feet for increase of dividend, and 2s. 11d. for reduction of dividend, for the purposes of the sliding-scale. The Great Marlow Order is to give authority to the Great Marlow Gas Company, Limited, to maintain and continue gas-works, to construct new works, and to manufacture and supply gas in Great Marlow and the neighbourhood, in the counties of Berks and Buckingham. The amount of capital is limited to £24,000 by shares, consisting of £9000 of original, and £15,000 of additional capital and £6000 by loan. Sale of gas in bulk by agreement beyond the limits of supply is authorized; and the maximum price to be charged for gas is fixed at 4s. 10d. per 1000 cubic feet, with power to the Board of Trade, after three years, to alter that price, or substitute a standard price with a sliding-scale as to price and dividend. The King's Lynn Order is to empower the King's Lynn Gas Company to raise further capital not exceeding £6400 by shares or stock, and £1600 by loan, and to construct additional works. The Whitchurch Order is to authorize the Whitchurch (Salop) Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas in the parish of Whitchurch. The amount of capital is limited to £25,000 by shares, consisting of £20,500 of original, and £4500 of additional capital, and £6250 by loan. Authority is given to sell gas in bulk by agreement beyond the limits of supply. The maximum price to be charged for gas is fixed at 4s. 7d. per 1000 cubic feet, with power to the Board of Trade, after three years, to alter it as in the other cases.

The second Bill contains Orders relating to Cannock, Colwall, Crossgates, and Slough. The Cannock Order is to empower the Cannock, Hednesford, and District Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas within the parishes of Cannock, Cheslyn Hay, and Great Wyrley, in the county of Stafford. The amount of capital is limited to £40,000 by shares consisting of £35,000 of original, and £5000 of additional capital and £10,000 by loan. The new share capital and the mortgages are to be subject to the auction clauses. The sale of gas in bulk by agreement beyond the limits of supply is authorized. The minimum illuminating power of the gas to be supplied is fixed at 14 candles, and the maximum price to be charged for gas at 4s. 6d. per 1000 cubic feet, with power to the Board of Trade, after three years, to alter it, or to substitute a standard price with a sliding scale. Provision is made for the sale of the undertaking, under certain circumstances, to the Cannock Urban District Council. The Colwall Order is to authorize the Colwall Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas within the parishes of Colwall and Coddington, in the county of Hereford. The amount of capital is limited to £8000 by shares, consisting of £5000 of original, and £3000 of additional capital, and £2000 by loan. The sale of gas in bulk by agreement beyond the limits of supply is sanctioned. The maximum price to be charged for gas is fixed at 5s. 8d. per 1000 cubic feet, with similar power to the Board of Trade as in the other cases. The Crossgates Order is to empower the Crossgates, Halton, and Seacroft Gas Company, Limited, to maintain and continue gas-works, and to manufacture and supply gas in the parish of Seacroft, and the hamlets of Halton, Colton, Whitkirk, Crossgates, Manston, Stanks, and Scholes, in the West Riding of York. The amount of capital is limited to £9410 by shares, consisting of £7410 of original, and £2000 of additional share capital and £2352 by loan. The sale of gas in bulk by agreement beyond the limits of supply is authorized. The maximum price is fixed at 4s. 6d. per 1000 cubic feet, with the usual power to the Board of Trade. The Slough Order is to enable the Slough Gas and Coke Company to construct and maintain additional gas-works. The standard price of gas is fixed at 4s. 5d. per 1000 cubic feet within the authorized limits of supply other than the parish of Datchet, and 4s. 8d. within the parish, with a sliding-scale.

THE WIDNES GAS AND WATER UNDERTAKINGS.

An Appreciation of Mr. Isaac Carr's Management.

At the Meeting of the Widnes Town Council last Tuesday, the minutes presented by the Gas and Water Committee contained the following recommendation: "That, having regard to the success of the gas and water undertakings for the last financial year, which, in the opinion of this Committee, is largely attributable to the careful and able management of Mr. Isaac Carr, Assoc.M.Inst.C.E., a bonus of £60 be voted to him for his special services during the year.

Alderman Timmis, the Chairman of the Committee, in moving the adoption of the minutes, explained that the course recommended was necessitated by the fact that the Council at the last meeting declined to suspend the Standing Orders so as to consider a proposal to increase Mr. Carr's salary. He believed they unanimously agreed with the proposed increase; but there was a difference of opinion as to when it should be carried into effect. It was suggested that the proposal to suspend the Standing Orders was a precedent that should not be set; and it was suggested that the Engineer should be given a bonus for his services, and the question of salary deferred until February next. In consequence, the Committee carefully considered the question at their last meeting, and finally decided to recommend the Council to grant the bonus named, which represented what they wished to give as salary. At the last meeting it was stated that were they to sell the gas at the price of their neighbours—that was to say, at 2s. 8d. and 3s. per 1000 cubic feet—the consumers of Widnes would pay £15,000 per annum more than they were now asked to pay for the same quantity of gas. It was further emphasized that Widnes was in the exceptional position that the gas consumers and ratepayers were practically one and the same; and that, therefore, any benefit conferred by the manufacture of gas was conferred upon the people of the town. It was the common practice almost throughout the country (with the exception of very large towns) for Consulting Engineers to be called in when extensions became necessary. At Widnes, however, Mr. Carr had not only designed the building and plant of their large and important extensions, but had also, for the most part, carried out the work with the Corporation's own workmen, and this at an exceedingly low cost. Those who had seen the works knew that they were good and substantial in appearance; and the excellent profits that were being made from year to year testified to their efficiency. Though the works had been practically reconstructed, the aggregate capital stood at only 7s. per 1000 cubic feet; and when the works were making up to their full capacity, the figure would be but 4s.—thus proving the low cost at which the extensions had been carried out. The above figures appealed with greater force when taken in comparison with the capital of other corporation gas-works, where it amounted in one case to as much as 17s. 3d., and in many others to little short of that. It was contended that many thousands of pounds had been saved in the reconstruction of the gas-works when compared with what was expended on similar works in other towns. The retort-house building cost £1500, or 1·61d. per cubic foot of contents, which was an exceedingly low figure. With regard to the retort-bench, the standard cost of similar work was £46 per mouthpiece, without a building. The cost at Widnes was £26 per mouthpiece, representing a total saving on the 112 mouthpieces of £2240 in this instance alone—£20 per mouthpiece. The cost of the whole work was, however, £4500, or £40 per mouthpiece, with the building and coal-shed included. The annual saving arising from the working of the new retort-house would be £600 on the present production, due to economy of coke used in the furnaces, and to improved facilities arranged by Mr. Carr for carrying out the work. The total capital expended on the gas-works extensions, including the new gas-holder at Ditton, was less than £22,000. Comparing the cost of gas making and maintenance of works at Widnes with the cost of other corporation gas-works similarly situated as regarded proximity to coal-fields and quality of gas supplied, the results showed in favour of Widnes to the amount of 5¼d. per 1000 cubic feet, or, on the Widnes make, £4375 per annum. There were no capital charges in these figures—they were simply a comparison of the cost of manufacture of gas and maintenance of works; and the difference represented the value of the Widnes management over the others. The expense of manufacture in Widnes might be increased by this amount, and still the excuse might be made that the cost was only the same as some others, and even less than a great many, had they a less competent Manager. The recent achievement at Stocks Well—*i.e.*, the successful completion of the work in connection with No. 2 well—was an instance where plant costing about £20,000, which was in danger of total collapse, and which many engineers would have abandoned as hopeless, had been rendered equally permanent and more efficient than it ever was previously; thus saving the enormous outlay that would have been necessary to replace it. He did not know of any other two works of the size of those at Widnes which were being managed for the same amount, because it was not possible to compare their town with others of similar population. Their consumers were more approximate to a town of 100,000 inhabitants. At Widnes they were in the happy position of having gas and water at exceptional prices largely owing to the ability of their Engineer.

Alderman Gossage seconded the motion; and, after a few remarks by members of the Council, it was carried unanimously.

SOUTHPORT CORPORATION GAS SUPPLY.

The Gas Engineer's Report.

The Engineer and Manager of the Southport Corporation Gas-Works (Mr. John Booth) has presented to the Gas Committee his report on the working of the Gas Department during the financial year ending the 31st of March. He notes at the outset that the make and sale of gas have not kept pace with those of former years. This fact, he says, is to be attributed to two causes—the substitution of the electric light for gas for private lighting, and the mildness of the past winter. During the history of the Southport Gas-Works, covering a period of 48 years, there are only two occasions where a decreased make of gas is shown; these being the years 1879-80 and 1897-8. The total increase in the gas made during the seventeen years ending 1896-7 was more than 121 per cent.; the average annual increase being upwards of 7 per cent. After such an annual increase, Mr. Booth says it is a new experience to find a decrease. But it is due to the electric light having, during the last three years, replaced gas in the premises of many of the larger consumers; and the loss of these has not been made up by new consumers of equal capacity or numbers. The total quantity of gas made during the past financial year was 368,694,000 cubic feet; the decrease on the make in the previous year being 764,000 cubic feet, or 0·2 per cent. For each of the previous three years the increased make of gas was as follows: 1894-5, 11·47 per cent.; 1895-6, 1·88 per cent.; 1896-7, 3·34 per cent. The total quantity of gas sold was 358,257,700 cubic feet—an increase of 1,616,900 cubic feet, or 0·45 per cent. For lighting there was a decrease of 18,204,500 cubic feet; and 1,058,600 cubic feet less gas was burnt in the public lamps—together, 19,263,100 cubic feet. On the other hand, there was an increase of 20,874,400 cubic feet used for cooking purposes. There were 2,574,600 cubic feet of gas consumed in the works and offices and supplied free; and 7,861,700 cubic feet were

unaccounted for, or 2·13 per cent. The gross profit for the year is £15,154. After paying interest on loans and stock, amounting to £5854, also the sinking fund apportionment, £2584, there remains a net profit of £6716. Of this amount, £200 is added to the reserve fund; leaving an available balance of £6516. Compared with last year, the net profit shows a decrease of £2322. Mr. Booth emphasized the fact that the past year was an exceptional one; showing a decrease in the total quantity of gas made, and a decreased revenue from the gas sold for lighting purposes amounting to £2795. The revenue from gas sold for other than lighting purposes shows an increase of £2677. But this gas was supplied during the year at practically cost price; and as there was a decreased consumption of profitable gas, the profits of past years could not be maintained. In the past year also there was, for the first time, a total absence of meter-rents, which were equal to about £1300 per annum, or 1d. per 1000 cubic feet of gas sold. During the past three or four years a large outlay has been incurred on revenue account in relaying and enlarging the mains. This having now been completed, a reduced expenditure under this head may be looked for in the future. Taking into consideration all the facts, Mr. Booth says the financial results of the past year's working must be considered satisfactory.

The report above noticed was upon the minutes presented by the Gas Committee at the meeting of the Town Council last Tuesday, but when moving their adoption, the Chairman of the Committee (Mr. Dimond) asked permission to withdraw the report—at the same time expressing his pleasure at being able to announce an increased delivery of gas to the extent of 5 million cubic feet since the 1st of April. Alderman Unwin having seconded the motion, Mr. Travis said he thought some reason should be given for the withdrawal of the report. Mr. Dimond said he did not know till that afternoon that it was to be withdrawn. He was prepared to discuss the whole question at the proper time; but seeing that an explanation was required on a matter which did not appear on the report, it was deemed advisable by the Committee that it should be withdrawn. There was nothing he feared to discuss in connection with the minutes, and he should perhaps be able to prove that the gas estate was in a very satisfactory condition. The Mayor (Alderman Booth) remarked that the report could not be withdrawn unless the Council sanctioned it. The Town Clerk (Dr. J. Davies Williams) said the report constituted a portion of the minutes. The Chairman of the Committee, by the instructions of that body, wished to withdraw the report. As a matter of strict order, no doubt the Council had a right to be consulted as to whether this course should be adopted, but he had never known a case where, when a Committee had decided to ask their Chairman to withdraw a portion of the minutes, the Council had objected. This was the strict position. Alderman Vaughan then moved that the Council allow the report to be withdrawn; and the motion was carried. This led to the withdrawal by Dr. Weaver of the following motion standing in his name upon the *agenda:* "That a first-class expert be engaged to report upon the gas estate, with instructions to recommend to this Council any improvements which, in his opinion, would be likely to result in an increased profit." He, however, gave notice that he would bring it forward at the next meeting.

METROPOLITAN WATER SUPPLY COMMISSION.

Twenty-ninth Day—Monday, July 11.

(*Viscount* LLANDAFF, *Chairman, Major General* A. DE COURCY SCOTT, *Mr.* A. DE BOCK PORTER, C.B., *and Mr.* R. LEWIS.)

The sitting took place at the Guildhall, Westminster.

The following Counsel are engaged: Mr. POPE, Q.C., and Mr. CLAUDE BAGGALLAY, Q.C., for the New River Company; Mr. LITTLER, Q.C., and Mr. LEWIS COWARD for the Kent Water Company; Mr. PEMBER, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. RICKARDS for the Chelsea Water Company; Lord R. CECIL for the Hertfordshire County Council; Sir JOSEPH LEESE, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN, Q.C., for the London County Council; Sir R. NICHOLSON for the Middlesex County Council; and Mr. GABRIEL P. GOLDNEY (Remembrancer) for the Corporation of the City of London. The Southwark and Vauxhall Water Company are represented by Messrs. BIRCHAM AND Co.

Mr. *Andrew Johnston*, Chairman of the Essex County Council, examined by the CHAIRMAN, said he was a Director of the New River Company, but merely as representing another Company; and he was the representative of the New River Company on the Staines Reservoirs Committee. He gave evidence as representing the Essex County Council. The geographical county, including West Ham, had a population, according to the census of 1891, of 785,444; and the administrative county, of 578,471. The population of the district of the county served by the Metropolitan Companies was estimated to be now 295,393, which represented ten Local Authorities. The rateable value of the water district in 1897 was £1,043,993.

The CHAIRMAN: Have your Council supported or opposed the London County Council Transfer Bills?

Witness: Well, it is rather difficult to say. They have always petitioned against them. They have, however, been willing to agree to them on certain terms; and an agreement has been come to virtually in the last year, though it was never signed or sealed, because the Bills collapsed in the meantime. The terms were settled.

May I take it that the terms were to hand over to the county the supply and the distribution of water in the county?—Yes; roughly speaking that was the agreement.

Can you tell us why your Council are opposed to the London County Council purchasing and supplying in bulk?—I do not think we are opposed. It is a question of price. The Essex supply is much cheaper than in the rest of London; and the Council are afraid that if they took their supply in bulk, they would be obliged to pay the average of the whole of London. Essex pays something over 4d. per 1000 gallons as against more than 7d. paid by the rest of London. The Essex County Council, as a whole, have little, and did not wish to have anything, to do with the water question, unless upon terms which would guarantee them from pecuniary liability of any sort. I never knew the Council to take the slightest interest in the subject; they have left it to the Councils affected. I cannot say what resolutions the local Councils have come to on the subject of each being constituted a separate Water Authority. The only chance of efficient management would be to have a Water Authority for the whole of the portion of Essex now supplied by the Metropolitan Companies.

How would you constitute it?—In the first place, we are met with the initial difficulty that the County Council have no powers to promote a Bill of any sort to constitute a Water Authority; and the districts themselves would find it very difficult to secure unity for that or any other purpose. The primary essential, therefore, would be for the Government, or some other body, to get an Act passed to constitute an Essex Metropolitan Water Authority. We have provided for this to some extent in our agreement with the London County Council. I think they promised to introduce clauses which would give the Essex County Council power to introduce a Bill for the purpose, and pay the expenses in the first instance out of the county fund.

In answer to further questions, witness said there was no provision in the agreement with the Essex County Council as to taking water in bulk. The agreement with London and the resolutions of the Essex Local Authorities were all governed by the condition that the division of the East London Company's works and sources of supply into two separate and independent establishments was not only possible in an engineering sense, but could be effected without any serious increase of expense or diminution of efficiency, and that this should be proved to the satisfaction of the Commission. Sir Alexander Binnie gave it as his opinion that the division would be extravagant; and witness concurred in this view. The sources of supply which Essex contemplated getting from London were as much of the wells and intakes of the East London Company—the only Metropolitan Company supplying in Essex—as would be sufficient, not only for the present, but for the future population of the district, which would be three or four times as great as at present, assuming the same rate of increase to continue. Essex had not sought expert advice as to whether they had sufficient water in the county for future increase in population. Essex wished to guard against the danger of being put to great expense in going a long distance for a new supply. Essex at present had the water, and ought to have the right to take it even if doing so caused London to go to Wales.

Mr. PEMBER, in reply to the Chairman, said roughly about one-third of the East London Company's water went to Essex.

Witness (continuing) said if more water was wanted by the Metropolis generally, Essex would be prepared to pay the cost of bringing it from a distance—if anybody could show a better right to Essex water than Essex. The quantity of water used by Essex was, very roughly, about 11 million gallons daily.

Some conversation passed as to the capacity of the wells of the East London Company, in the course of which Mr. Pember stated that the Company were now pumping daily from a well at Waltham 1½ million gallons; from a well at Chingford, 2 million gallons; from a well at Walthamstow, 4 million gallons; and from a well at Lea Bridge, 3 million gallons—a total of 10½ million gallons. Owing to improvements being made in the adits, the 2 million gallons from Chingford were being turned into the Lea, so that the present supply from the wells was only 8 million gallons a day. In wet weather, when plenty of water was otherwise obtainable, the Company did not pump to the full amount.

Examination continued: The Council did not think the question of purchase was ripe enough to consider what its results would be.

Upon the whole is Essex against purchase by any body?—He did not think they had had any expression of opinion that would give him the right to say whether Essex was against purchase by any body. As to each Local Authority taking water in bulk and controlling only the distribution pipes, the difficulty was that pipes seldom ran through one parish or one district only. The Essex County Council would not, if they could avoid it, become a Water Authority; but the constitution by Parliament of an Essex Water Authority would be a most satisfactory body to deal with the purchase of water in bulk from (say) the London County Council. This body would be representative of the districts concerned, and would levy a uniform rate over the whole area. The portion of Essex not served by the Metropolitan Companies was supplied in all sorts of ways—from horseponds to local companies. If Essex purchased the portion of the East London undertaking in Essex, the County Council would wish to throw the cost on the district benefited—not on the whole county. Witness personally was perfectly content with the present supply, as regarded quality, quantity, and price. His Council were indifferent on the subject. If there were any change the consumers would have to pay more. As regarded control, he said there was a cry from one district that the constancy of the supply should be assured. The 1897 Act had never been applied to attaining this end.

By Mr. H. L. CRIPPS (for the London County Council): As to which county had the prior right to water—the one above or the one below the intake—he held this to be a question for a casuist. If he lived above, he should say the county above; if he lived below, he should say the county below.

Mr. *W. B. Whittingham*, Chairman of the Water Supply Committee of the Essex County Council, which consisted of representatives of the Council and of the ten Local Authorities in Essex concerned in the Metropolitan Water Supply, said the Committee were not averse to the utilization of the water of the East London Company; but they were not agreed in promoting purchase. There was a strong feeling against the London County Council coming over the borders of Essex. The supplies being derived from Essex, they held that if these were to be purchased, Essex or some representative body should undertake it; but there was no great desire to purchase. The ten Local Authorities were not altogether satisfied with the *status quo*. The supply ran short recently; and with regard to cottages where there were no cisterns, they held that there should be a constant supply. No steps had, however, been taken under the Act of last year, to secure such a supply. While Essex would ask for the whole of the well and river sources, they would not want, for some time, to utilize all of them; some share of the river water might be left for London. The supply from the wells was very rapidly increasing; and no complaints had been received of diminution of the flow of other wells or rivers in consequence. The charges of the East London Company were based, he believed, on net rateable value, with very large additions for high service and other extras.

By Mr. PEMBER: It might be that out of 195,000 houses in the East London district, 193,400 had a constant supply.

Mr. *William Ivey*, Mayor of West Ham, put in a table showing that both in population and rateable value the borough had developed enormously. The increase of recent years had not been so rapid; but he thought the population would grow eventually to 600,000. The East London Company was the only one supplying in the borough, which contained 39,000 houses besides numerous factories, dockyards, &c. In 1894-5-6, the supply was short, owing to drought and frost; but he supposed they were no worse off than other districts. On the basis of 35 gallons a head, the daily domestic consumption would be about 9½ million gallons, which, with the requirements of the ten other Essex Local Authorities supplied by the East London Company, made a total of about 19 million gallons daily. The population of the East London Company's area inside London, he should say, was about stationary. Subject to the Water-Rate Definition Act of 1895 being applied to West Ham and the surrounding districts, and a constant and sufficient service being guaranteed, his district was fairly well satisfied with the present water supply.

The CHAIRMAN: Do the East London Company in West Ham base their charges on the gross or the net rateable value?

Witness: There is no standard that we know of on which the Company base their charges. It is really the gross and more; it is not the net, as it is in the Metropolis. The borough had asked to be charged on the net.

The CHAIRMAN, on referring to the Company's Act, said that they were authorized to charge on the annual value of the house, which in Dobbs's case meant net annual value.

Witness said they had not taken the case to the Courts. As to purchase by the London County Council, he said if this body were prepared to give all West Ham asked—the matters he had already referred to, and which were practically embodied in the agreement between West Ham and the Council—West Ham would not object. West Ham had not considered what portion of the East London Company's sources of supply would be required for Essex. London had some claim on them; and he suggested that if they were equally divided, Essex would have sufficient, especially if there were more water to be obtained in Essex. After purchase, he should not expect that the charges would be increased. Looking to the magnitude of the question, he thought the State might well effect the purchase; settling the question of management afterwards. There would then be an absolute guarantee that the water was pure, and less trouble, less dispute, and more likelihood of a complete settlement, than if the London County Council were the purchasing body. The undertakings could then be easily split up among the various local bodies. West Ham was quite willing to join with Essex in the matter of water supply, and was prepared to face a rate-in-aid, or whatever was fair.

By Mr. POPE, for the East London Water Company: There was a clause in the Company's Act of 1894 giving West Ham a constant supply; but occasionally complaints were received. As regarded the Water-Rate Definition Act, he complained that it did not apply to West Ham.

Mr. POPE: Is not the whole question this—that everybody was agreed upon the principle on which the charge should be made, but that you, not having made the Valuation Act of 1869 apply to West Ham, could make your rateable value what you liked. Is not that the difficulty discussed in 1894 between yourselves and West Ham?—Yes. The borough asked to have a clause inserted in the Company's Act making the basis of charge "net annual value," and it was refused; the Company saying that if the borough was valued as other portions of the Metropolis were valued, they would supply on that basis. Still, witness held that the borough had offered to put a new column in their list, so that the net rateable value should be on the same basis as in the rest of London.

By Mr. H. L. CRIPPS: The borough did not object to buying in bulk from London, if the agreement were maintained.

Mr. *Frederic Harris*, Treasurer of the County Borough of West Ham, handed in a table showing the actual charges of the East London Company in West Ham.

The CHAIRMAN: Is the water-rate actually charged higher than their statutory charge on the rateable value, as fixed by the Local Authority?

Witness: Yes.

Is it higher than the water-rate charged in London?—Considerably. On 29,000 cottages in the borough, the assessment was exactly the same as in the remainder of London. The grievance was that the Company themselves fixed the net annual value, and that this differed from the rest of London—being, in the case of small property, from 6 to 25 per cent. in excess, and in the case of larger house property from 3½ to 10 per cent. in excess. Practically the assessments were the same in West Ham as in the rest of London—save as to houses of £40 and upwards, in regard to which West Ham took off one-fifth, whereas in London they took off only one-sixth. Personally, witness would be glad to see the Metropolis Valuation Act made applicable to the whole Union. For an ordinary cottage of 8s. a week, the Company's charge in West Ham would be 12s. 6d., as against 11s. in the rest of London. He knew no reason justifying the excessive charge in West Ham.

Mr. DE BOCK PORTER: If you adopted the Rating Act, you might have these charges reduced?

Witness: Yes.

Why do you not adopt it?—We have not power. It applies only to the Metropolis. The Company take from West Ham about £3000 a year to which they are not entitled.

Mr. POPE said the Corporation had not been able, or willing, to accept the Act of 1869; and the Company therefore had fixed the rateable value under the Water-Works Clauses Act.

The CHAIRMAN remarked that, according to witness, the assessments were perfectly fairly made; and there was no difference between them and those of the rest of London.

Mr. POPE said the Company would be content with the valuation under the Act of 1869; but they were not with the present method.

Witness said the borough had offered to insert in the rate-book a column giving exactly what the Company wanted.

Mr. *W. K. Marriott*, Chairman of the Barking Urban District Council, said the Council were within the area of the East London Company, but were entirely served by the South Essex Water-Works Company, whose supply was indifferent and dear, though their charges were within their statutory powers. The Council had not required the East London Company to supply, because the Company were sinking wells in Barking, and the Council were waiting the result. Barking would join with other Essex Local Authorities to form an Essex Water Authority. At present, they were paying 10d. per 1000 gallons for water for street watering, as against 4d. charged by the East London Company in other parts of Essex. The present domestic charge was 7½ per cent. on the net rateable value of houses at £30 and under; and 6 per cent. on houses above this value. Barking rather objected to the Essex County Council being constituted a Water Authority. They wanted a Board representative of all Essex, to buy from London the Essex portion of the East London Company, by which means they thought they could secure a better and cheaper supply. They had not, however, gone into details as to cost. If the terms were satisfactory, they would also be content to take water in bulk from the London County Council.

Mr. *Alfred Plant*, Accountant to the East Ham Urban District Council, which is solely served by the East London Water Company, said the district had been very rapidly developing; but it was now advancing, and would continue to advance, he thought, at a slower rate. The district was in the same Union as West Ham; and practically the same difficulty as to charging arose as in West Ham.

Mr. *T. L. Knight*, Chairman of the East Ham Urban District Council, also gave evidence on behalf of East Ham. If the East London Water Company were to be broken up or taken over, witness said his Council considered they should have control of their portion.

Mr. *Musgrave*, formerly Chairman of the Leyton Urban District Council, said the district, which was growing very rapidly, was entirely supplied by the East London Company. He complained of shortness of supply, especially during periods of drought and frost. All the houses were supposed to have a constant supply, but it was not so in fact. The Council had complaints, but had taken no action, because they were advised they were not a Local Authority under the Act of last year. The Council thought the undertaking should be placed in the hands of a popularly elected body, on which they would be represented and bear their share of the burden. If this could not be done, they were prepared to take water in bulk from (say) the County Council, provided they received the same quantity and at the same price per head as other localities. Very much the same rating difficulty arose in Leyton as in East and West Ham.

Sir *John Evans*, Vice-Chairman of the Hertfordshire County Council, examined by the CHAIRMAN, said the amount of water supplied in the county by a Metropolitan Company was small; but the abstraction by the New River Company was large. There were so few parishes in the area of a Metropolitan Company, and the number of inhabitants of these parishes was so few, that Herts thought it would not be worth while to purchase the undertakings. Purchase by the London County Council would be worse, because the tendency would be to take more water from Herts. He was not aware that there was any desire in Herts to buy the Herts portion of the Companies' concerns. Herts claimed the whole of the water in the county, as belonging to Herts. On the whole, the county was hostile to purchase by the London County Council, which body had stated that they had a statutory right to take all the water they desired from Herts. Their statutory right depended on the statute; but they seemed to be straining it. The bulk, too, if not the whole, of the wells sunk by the New River Company had been sunk without parliamentary sanction. Witness believed that all the wells in Herts rested upon the ordinary rights of landowners, and not on any special sanction. The complaint of the county was that the ordinary or common-law right of an owner had been strained, so as to enable one person to drain all the water of a district, and take it away to London for his own profit. There could not be a common-law right enabling a man to purchase a quarter of an acre of land, and pump 10 million gallons of water daily for the use of London, as had actually been done.

Major-General SCOTT: You mean this: The Companies have obtained the right by parliamentary statute to lay mains and levy rates for water, and they have applied these rights to water obtained without a Parliamentary Bill?

Witness: Yes. The pumping that has gone on has seriously affected other wells and springs in the county. At Cheshunt the New River Company, though their pipes pass through the locality, refuse to supply.

The CHAIRMAN: I see the Balfour Commission took the view opposed to that which your are now expressing?

Witness: Yes, and opposed to that of their own Commissioner.

In answer to further questions, witness said that, regarding control, the Act of 1897 went in the right direction. He would, however, vest the control under the Act in the Local Authority, with possibly a reference to the County Council. He agreed that, as to the quality of the water, the consumers should be the persons to complain. Then power should be given to compel a Company to give a supply of water to a district through which they passed. Thus Cheshunt was without water, though it was in the area of the New River Company. The Company had been called on to supply; but they refused, except at a price which was so exorbitant that the locality sought a private supply.

Mr. POPE said Cheshunt had a supply of its own; and he believed there was something in the Company's Act of 1852 which relieved them of the obligation to supply where the district was supplying itself.

Witness (continuing) said the supply at Cheshunt was diminishing, in consequence of the pumping of the New River Company. Provided parishes were willing to comply with the requisitions of the law, they ought to have a first claim on water, before it was carried away from them. He thought, also, it would be a great advantage if all the Water-Works Acts were consolidated, so that everyone concerned could know where they were.

The CHAIRMAN: There we are all with you.

Witness went on to urge a change in the law as to the charges leviable, whereby if a man's rating were raised, unless he increased his consumption of water, his water-rate should not be raised. The principle of charging on rateable value was bad; the charge should be by meter. To meet the case of poor houses, there should be some provision similar

to that prevailing now in some localities—viz., that houses of a certain rateable value should be supplied at not more than (say) 2d. a week. He did not think the charges were likely to be reduced by purchase; and if purchase were carried out, the liability to famine of the increasing outside areas would be materially increased. The owners of the water undertakings should be restricted to abstracting from present sources what they were now taking, or something less; and if more water was needed, the London County Council or some other wealthy body, should bring it from Wales, and the Companies be compelled to buy it in bulk. The draught upon the Lea and underground supplies was greater than these sources could bear; and unless something was done, there was great danger of a water famine. Purchase might come afterwards. The wealthy body would sell water to the Companies at a profit; but whether the Companies would be able to make a profit, he did not know.

Major-General SCOTT: What is to prevent the Companies going to Wales also?

Witness: If the Companies were to join and go to Wales, that might be a solution of the difficulty. Further control with regard to underground water is needed.

The CHAIRMAN: What is the sort of control you desire?

Witness: First, we say no Company should sink any well for the purpose of their undertaking without the express authority of Parliament inserted in their Special Act.

That is to say that you think Companies who are carrying on the business of selling water ought not to have the ordinary rights of landowners?—Yes. The private owner of underground water has no right to sell it in large quantities. Still I would not prevent the brewer or maker of aerated waters from selling the water obtained from his own land as beer or aerated water. The General Act which I suggest should also require that the amount of water proposed to be abstracted from any well by a Company should be inserted in the Special Act authorizing the construction of the well; and this quantity should bear a direct relation to the discharge of the river basin. In other words, no one should be able to sink a well beside a river and abstract its flow. The Act should further provide that all companies proposing to construct and obtain their supplies of water from wells, should be under obligation to afford supplies of water to any persons or authorities in the neighbourhood of the proposed wells whose water supplies may be affected by their pumping. No water company should contract with any individual or company having a well for the supply to such water company of water from such well for any of the purposes of their undertaking.

The CHAIRMAN: What are the Companies to do. You say they are to obtain no more water from the Thames or the Lea or from the wells. Where are they to get it from?—Wales. In every instance where a river has been taken and a reservoir formed, compensation has been given; but with underground water, there is no compensation.

The truth is your quarrel is with the English law as to underground water?—It is to some extent. Where a well is constructed in the basin of a river or stream, a record should be kept of the effect on the flow of the stream. The result of pumping is first to stop the flow of a river, and perhaps ultimately to draw water which the stream brings from other sources.

We understand there are new wells being sunk by the East London Company?—I am afraid there are.

Is that under statutory authority?—I believe not.

Are there any wells constructed by the New River Company without parliamentary power to raise capital for the purpose?—All of them.

Lord R. CECIL: I understand the great mass of the wells have been sunk out of revenue.

By Major-General SCOTT: County Councils should have power to inspect sources of supply, and Local Authorities to inspect the domestic plant, mains, &c. He agreed it was a matter that would require much consideration, seeing the large number of Authorities in each Company's area. The Local Authorities should also have power to analyze the water, because what was good in one district might not be in another.

The Commission then adjourned for a week.

The thirtieth sitting of the Commission was held yesterday, at the Guildhall, Westminster—Lord Llandaff presiding. The first witness called was Mr. Henry Weeden, Vice-Chairman of the Ilford Urban District Council, who stated that the Ilford district was enormously increasing both as regarded rateable value and population. The water supply was derived from the East London and South Essex Companies; both Companies having concurrent powers over the whole area. They had, however, partitioned the district—he presumed by agreement. The result was not satisfactory, because the East London Company's supply was in every respect superior to that of the South Essex Company.

Hexham Gas Company.—The shareholders of this Company last Wednesday authorized the Directors to raise £6000 additional capital. The continuous increase in consumption has necessitated the construction of a new gasholder and the carrying out of other improvements.

Isle of Wight Rural District Council and the Bembridge Gas and Water Undertakings.—A draft agreement to purchase the gas and water undertakings at Bembridge was submitted for the consideration of the Isle of Wight Rural District Council last Thursday. The purchase money, it was stated, has been fixed at £3060. The Council decided to complete the purchase one month after the consent of the Local Government Board had been obtained.

New Joint-Stock Companies.—The Irish Calcium Carbide Company, Limited, has been formed with a capital of £60,000, in £1 shares, to acquire and take over the Campbell Mills and Water Powers at Collooney, County Sligo; to enter into and carry into effect an agreement between Anna Icardi Alexandrina Sim and Alexander Sim of the one part and James Fitzgerald, on behalf of the Company; and to carry on the business of manufacturers of, and dealers in, calcium carbide and other materials for the manufacture or supply of acetylene or other gases. The Kinsey Acetylene Gas Company, Limited, has been formed with a capital of £2000, in £1 shares, to acquire, develop, and deal with a patent connected with the manufacture and storage of acetylene gas, and to adopt an agreement with H. Kinsey.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The following official statement regarding the result of the year's working of the Glasgow Corporation Gas Department, was published on Thursday: "The accounts of the Glasgow Gas Department were submitted to the Finance Committee yesterday. They showed a surplus of £69,574; the income being £631,654, and the expenditure, including depreciation, £562,070. The balance goes to sinking fund, interest on loans, &c. In the previous year the income was £607,622, and the expenditure £539,325—a balance of £68,297." These figures do not, on the face of them, disclose the enormous growth of the business of the department. The increased rental derived from gas is £15,538; and as the price at which the gas was sold was 2s. 2d. per 1000 cubic feet, the increased output must have been about 140 million cubic feet. The year just closed has, however, been by no means in all respects the most notable. The gross revenue is the highest which has ever been received; the next highest having been in 1894-5, when, with gas selling at 2s. 6d. per 1000 cubic feet, £629,362 was received. But in the matter of increase of business, the past year does not compare well with the year preceding, when the increased output of gas was reported to have been 366 million cubic feet. It may be that the community of Glasgow, having gone in very largely in previous years for the use of gas for cooking and heating, there is not now so good a field for expansion as in other towns which took later to this outlet for gas. In this case, gas increases in Glasgow would have to depend almost entirely upon the extension of the city; and I do not know that this will be quite so rapid in the near future as it has been. In the first place, Dumbarton has been put into possession of a competitive railway; then the town of Renfrew has obtained from the House of Commons a Bill for the construction of a large dock, and may also persuade the House of Lords to pass the measure; and, lastly, I observed the other day that one of the leading Railway Companies was charged with boycotting the port of Glasgow, and promoting the port of Ardrossan. These are all forces which will have to be reckoned with in estimating the expansion of the city of Glasgow. Of course, the advancement of these places, or either of them, would not necessarily mean the decay of Glasgow, but merely a check to its development; and in this the gas consumption would be involved.

The Glasgow gas coal contract has led to an incident of an unpleasant nature. On Thursday last, the "Glasgow Herald" made the following announcement: "The Glasgow Gas Corporation have just purchased a portion of the supplies of fuel for which tenders were recently invited. At this time of the year, the Corporation generally buy between 500,000 and 600,000 tons of all classes for delivery during the ensuing twelve months; but on this occasion they have so far bought only a comparatively small proportion of their requirements. We understand they have taken about 150,000 tons of cannel coals—one lot of seconds at 9d. per ton advance on last year's price, and two lots of 20,000 tons at the price paid a year ago. Third-class cannels were tendered at 1s. per ton advance, and have been met with a counter offer from the Corporation at 9d. advance. With regard to splint coal, it is stated that the Corporation have so far not bought any of this description, but have purchased from 25,000 to 50,000 tons of main coal from the Cambuslang district at 8s. a ton delivered—2s. advance on last year—and have offered to buy the best splint at the same price. Coalmasters will not accept this figure, which is considerably under the prices current in the market for some weeks past." Yesterday the same newspaper published the following: "We have received the following letter from Mr. John Bowers, Deputy Town Clerk of Glasgow: The paragraph which appears in the commercial news of the 'Herald' of this morning, with reference to the purchase of coal by the Corporation for the gas-works, has been brought under the notice of the Chairman of the Gas Committee. No one had any authority on behalf of the Corporation to convey to the newspapers any information in regard to this matter; and I am directed to say that the statements contained in the paragraph are quite erroneous and misleading. Our information was obtained from quarters in which we had reason to put confidence." The Committee evidently desire that their action in the matter should not be disclosed in the meantime; and I am therefore precluded from giving the statement of the "Herald" as authoritative, or from commenting upon it.

The Glasgow Gas Committee have appointed a Sub-Committee to consider the propriety of the Corporation themselves undertaking the making of meters for use in the business of the department. This is an announcement which may be expected to produce some consternation among meter makers; but they will be powerless to resist the action of the Corporation, should it be resolved to go on with the proposal.

It is greatly to the credit of those who have been leading the agitation in the Peebles Town Council in the matter of acquiring the undertaking of the Peebles Gaslight Company, Limited, that they have allowed themselves to be persuaded by Mr. W. Young as to the terms on which the transfer may be made. They took up an attitude which was, to say the least of it, harsh towards the Gas Company, in their proposal to at once terminate the Company's existence by forcible means, and to pay the shareholders £157 10s. for each £100 of stock. Mr. Young's proposal was that the Corporation should take over the undertaking on the footing of paying 10 per cent. terminable annuities. There is every appearance that the Committee arrived at their decision without due consideration. But when confronted with facts, upon which nobody was better able to inform them than Mr. Young, they have come to see that they must either withdraw the proposal to acquire the Company, or offer better terms. I say again that it was to their credit that the Committee kept an open mind on the subject, and that they listened to the reasoning of Mr. Young. In his speech to the Town Council on Monday evening, Treasurer Williamson magnanimously admitted Mr. Young's large experience in gas matters, and went further in expressing the hope that he might continue to place his knowledge at the service of the Town Council in the event of a purchase being carried through. The recommendation of the Finance Committee was that they should acquire the Company on the basis of paying 10 per cent. annuities to the shareholders for 35 years, and that then they should redeem the annuities at the price of £157 10s. for each £100 of stock. Inquiries, the Committee reported, had shown that while in most of the recent cases

in which local gas companies had been acquired by corporations, a very high price had been paid (one much in excess of the market value of the shares), yet in every instance had the purchase proved advantageous to the community. This is a further admission—and a spontaneous one—as to the value of experience in such matters, because it was the very foundation of Mr. Young's position that, if the transfer went to arbitration, the shareholders would get more than the Corporation offered. Well, the result was that, Treasurer Williamson having spoken in favour of the recommendation of the Committee, and others having supported it, the Town Council adopted it unanimously. The threatened conflict has thus, it may already be said, been avoided; for the Directors of the Gas Company have considered the proposal, and resolved to recommend the shareholders to approve of it. It is a pleasure to witness the spectacle of people living together prepared to give and take in a matter of this nature, instead of persisting in menace or proceeding to hostilities, as was threatened but a few weeks ago. Both parties will benefit by the compromise. I use the expression "compromise" advisedly; for the Company, if they accept the offer—as there is every reason to believe they will—will agree to take less than they would have obtained had the terms been fixed by arbitration. I see—and it is the only point on which I differ from them—that the Corporation Committee say they regard the purchase price as a full one, and that arbitration might have resulted in the shareholders getting a smaller value for their shares. Now there is a parallel upon this point, which is conclusive of the matter, and is against the view of the Committee. In the case of the Edinburgh transfer, the annuities were fixed at a continuation of a 10 per cent. dividend; and they were made redeemable, after 20 years from the date of transfer, upon the basis of 28¼ years' purchase. That is to say, that for every £10 annuity in Edinburgh, the Gas Commission will have to pay £285; whereas, in Peebles, a £10 annuity will be redeemable for £157 10s., or 15¾ years' purchase. And in the case of Edinburgh, the Company had a reserve fund of £50,000, which they took with them; while in Peebles the reserve fund of £3000 goes to the Corporation. But for all this, when it is considered that by the acceptance of the offer the costs of litigation and arbitration are avoided, the terms are quite fair; and both parties will be well advised if they accept them. The Town Council have meanwhile resolved that, in the event of the Company accepting the offer, the transfer will be held to have taken place as at May 26 last; the Company to continue to manage the business until the Corporation have adopted the Burghs Gas Supply Act. In the event of the offer not being accepted, or the community not adopting the Act, the rights of both parties are reserved. I may add that this happy state of matters has been arrived at after negotiation with Mr. Young, with whom the Provost and Treasurer put themselves into informal communication, with a view to arriving at an understanding. The credit is thus not confined to one side, but is shared by both parties.

The final meeting of the shareholders of the old unincorporated Stirling Gaslight Company was held on Tuesday. The Chairman (Mr. J. Johnston) read a long statement as to the course of the late parliamentary fight and its origin. He claimed that the Company had reason to be satisfied, and wound up by announcing that, owing to the expense of the parliamentary struggle, the price of gas could not be reduced for some time. Mr. Chrystal, one of the Company's Solicitors, afterwards made a lengthy statement. He denied absolutely that the Company had tried to sell their works to the Corporation. The Corporation came, he said, to the Company, who had always been equally willing to sell or not to sell. He threw upon the Corporation the onus of the parliamentary fight. Both Messrs. Chrystal and Morris and the Chairman were thanked for the care they had bestowed upon the Bill. The annual meeting of the Company was held on the same day, when the accounts (now prepared in accordance with the provisions of the Gas-Works Clauses Acts) were submitted and approved of. It was explained that the reserve fund, amounting to £1500, and the balance at the credit of the revenue account, were to be carried to the credit of the account for renewals now being executed. This means that of the £5000 which, by their new Act, the Company are to pay out of revenue, in improving their works, they have already upwards of £2500 in hand. The Company have thus come out of their conflict with the Corporation in a quite satisfactory way.

The Falkirk Corporation Gas Department have closed their financial year with a deficit of £220. This result, the Convener of the Works Committee (Mr. Cook Rennie) explained at a meeting on Tuesday, had arisen, not on account of any miscalculation or mismanagement; for the estimates made up last year had been so carefully prepared that they would have had a considerable balance had everything gone right. But after the estimates were made up, the Burgh Assessor so raised the valuation of the works, that additional taxation was thrown upon them. They had also had a claim of £253 as royalty upon oil used. This matter of the royalty was sent to a Committee to consider whether it should be redeemed, and whether they could not place it to capital. As to coal, the Convener said they expected that it would cost from 1s. to, perhaps, 1s. 9d. per ton more than last year. They anticipated, however, that, with this against them, they would be able to pull through, and that it would not be necessary to raise the price of gas. The report was adopted.

The Denny Gas Commissioners last year sold 10,191,800 cubic feet of gas—a decrease of 1½ million cubic feet. The revenue from gas amounted to £1915; the total revenue being £2181. The balance of profit for the year was £255. At a meeting of the Commissioners this week, at which the annual accounts were presented, satisfaction was expressed at the manner in which the works are managed by Mr. J. M'Donald. Last year the price of gas was reduced by 5d. per 1000 cubic feet.

The annual meeting of the Irvine Gas Company was held on Tuesday. A dividend at the rate of 10 per cent. was declared; £450 was carried to the reserve fund; and the price of gas was continued at 3s. 9d. per 1000 cubic feet. In reply to a communication by the Corporation regarding the proposed acquisition by them of the Company's undertaking, it was unanimously resolved to authorize the Directors to negotiate with the Corporation for the transfer, on the understanding that the price should be fixed by arbiters to be mutually chosen, subject to approval by the shareholders at a special meeting.

GAS AND WATER COMPANIES STOCK AND SHARE LIST.

Referred to on p. 144.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
500,000	10	Apl. 15	10½	Alliance & Dublin 10 p. c.	23½—24½	..	4 5 9
100,000	10	,,	7½	Do. 7 p. c.	16—17	..	4 8 3
800,000	100	July 1	5	Australian 5 p. c. Db.	105—107	..	4 13 6
900,000	5	May 26	6	Bombay, Ltd.	6—6½	..	4 12 4
40,000	5	,,	6	Do. New, £4 paid	4½—5	..	4 16 0
880,000	Stk.	Feb. 24	12	Brentford Consolidated	280—285	..	4 4 3
240,000	,,	,,	9	Do. New	210—220	..	4 1 10
50,000	,,	,,	5	Do. 5 p. c. Prf.	140—145	..	3 9 0
159,375	,,	June 10	4	Do. 4 p. c. Db. Stk.	130—135	..	2 19 3
220,000	Stk.	Mar. 30	11½	Brighton & Hove Orig.	268—273	..	4 4 3
218,828	,,	,,	8½	Do. A. Ord. Stk.	195—200	..	4 5 0
933,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max.	127—132	..	3 15 9
430,000	20	Ma . 30	11½	British	53—55	..	4 1 9
50,000	10	Mar. 11	11½	Bromley, Ord. 10 p. c.	25—27	..	4 5 2
75,000	10	,,	8½	Do. 7 p. c.	20—22	..	3 17 8
500,000	10	Apl. 29	6	Buenos Ayres (New) Ltd	9—9½	..	6 6 4
98,123	Stk.	June 29	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	July 14	8½	Cagliari, Ltd.	30—31*	..	5 6 5
100,000	10	June 10	7	Cape Town & Dis., Ltd.	15—16	..	4 7 6
50,000	50	May 3	6	Do. 6 p. c. 1st Mort.	58—60	..	5 0 0
550,000	Stk.	Apl 15	13½	Commercial Old Stock	315—325	..	4 3 1
200,750	,,	,,	10½	Do. New do.	252—257	..	4 1 8
200,750	,,	June 10	4½	Do. 4½ p. c. Db. dc.	148—153	..	2 18 10
800,000	Stk.	June 10	12	Continental Union, Ltd.	207—212	+2	5 13 2
200,000	,,	,,	9	Do. 7 p. c. Prf.	193—197	..	4 11 5
51,600	Stk	Feb. 24	14	Croydon A 10 p. c.	310—315	..	4 8 11
168,400	,,	,,	11	Do. B 7 p. c.	255—265	..	4 3 0
535,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p. c.	125—130	..	4 0 9
60,000	,,	,,	5	Do. 5 p. c. Prf.	142—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd.	23¼—24½	..	4 9 9
354,060	10	,,	11	Do. £7 10s. paid	17—18	..	4 11 9
5,922,110	Stk.	Feb. 10	12½†	Gaslight & Coke, A, Ord.	297—302	+2½	4 1 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	120—125	+2	3 4 0
665,000	,,	,,	10	Do. C, D, E, 10 p. c. Prf.	303—313	..	3 3 11
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	154—158	..	3 3 3
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	230—240	..	3 2 6
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	195—200	..	3 10 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	308—313	..	3 3 11
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	184—188	..	3 3 10
1,761,150	,,	June 10	4	Do. 4 p. c. Db. Stk.	131—133	..	3 0 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	148—153	..	2 18 10
958,000	,,	,,	6	Do. 6 p. c. do.	198—203	..	2 19 1
70,000	10	May 12	8	Hongkong & China, Ltd.	13—14	−½	5 14 4
3,000,000	Stk.	,,	10	Imperial Continental	210—215	..	4 13 0
376,400	100	Feb. 1	4	Do. 4 p. c. Dbs. Red.	98—101	..	3 19 8
473,600	Stk.	Feb. 10	3½	Do. 3½ p. c. Db. Stk. ,,	103—106	..	3 6 0
560,000	100	Apl. 1	5	Met. of Melbourne	5 p. c. Db.	110—112	..	4 9 3
250,000	100	,,	4½		4½ p. c. Db.	107—109	..	4 2 7
					* Ex div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
75,000	5	June 29	6	Malta & Medn., Ltd.	4¾—5¼	..	5 14 3
541,920	20	June 10	5	Monte Video, Ltd.	14—15	..	6 13 4
617,946	Stk.	Feb. 24	9¾	Newc'tle & Gatesh'd Con.	235—240	..	4 1 3
252,355	Stk.	Jan. 3	3½	Do. 3½ p. c. Db. Stk.	115—120	..	3 18 4
150,000	5	May 26	8	Oriental, Ltd.	7¼—7¾	..	5 8 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6—6¼	−¼	5 10 9
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1½	..	4 11 5
60,000	5	Mar. 11	7	Ottoman, Ltd.	5—5½	..	6 6 2
500,000	100	June 1	6	People's Gas } 2nd M. of Chicago } Bd.	103—108	..	5 11 1
848,070	10	May 26	6	River Plate Ord.	9—9½	..	6 6 4
250,000	Stk.	June 29	4	Do. 4 p. c. Db. Stk.	96—98	..	4 1 8
250,000	10	Apl. 29	10	San Paulo, Ltd.	15½—16½	..	6 1 3
135,000	Stk.	Mar. 30	10	Sheffield A.	24⅝—248	..	4 0 8
209,053	,,	,,	10	Do. B.	245—248	..	4 0 8
447,427	,,	,,	10	Do. C.	245—248	..	4 0 8
5,531,250	Stk.	Feb. 24	5½	South Metrop., 4 p.c Ord.	142—145	+1	3 12 5
1,460,000	,,	July 14	3	Do. 3 p. c. Db. Stk.	100—103*	+½	2 18 3
60,000	Stk.	Mar. 11	12	Tottenham and } A.	285—295	..	4 1 4
60,000	,,	,,	9	Edmonton } B.	205—215	..	4 3 9
182,380	10	June 10	7	Tuscan, Ltd.	13—14	..	5 0 0
149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.	100—103	..	4 17 1
				WATER COMPANIES.			
746,164	Stk.	June 29	10½	Chelsea, Ord.	313—318	..	3 6 0
150,000	,,	,,	5	Do. 5 p. c. Prf.	170—175	..	2 17 2
160,000	,,	,,	4½	Do. 4½ p. c. Pf. Stk., 1875	148—152	..	2 19 3
175,785	,,	Mar. 30	4½	Do. 4½ p. c. Lb. Stk.	157—162	..	2 15 7
1,720,560	Stk.	Apl. 15	8	East London, Ord.	225—230	..	3 9 7
654,740	,,	June 29	4½	Do. 4½ p. c. Db. Stk.	157—160	..	2 16 3
390,000	,,	,,	3	Do. 3 p. c. Db. Stk.	103—105	..	2 17 2
700,000	50	June 29	7½	G'd Junct'n, 10 p. c. max.	115—118	..	3 3 7
310,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	140—145	..	2 15 2
708,000	Stk.	Feb. 10	13	Kent	360—365	..	3 11 2
160,000	,,	,,	7	Do. New, 7 p. c. max.	213—218	..	3 4 3
1,043,800	100	June 29	10	Lambeth, 10 p. c. max.	298—303	..	3 6 0
406,200	100	,,	7½	Do. 7½ p. c. max.	225—230	..	3 5 3
350,000	Stk.	Mar. 30	4	Do. 4 p. c. Db. Stk.	140—145	..	2 15 2
500,000	100	Feb. 10	13	New River, New Shares	482—487	..	2 19 6
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Db. Stk.	141—146	..	2 14 10
902,300	Stk.	June 29	6	Southw'k & V'xhall, Ord.	163—168	..	3 11 5
126,500	100	,,	6	Do. do. 7½ p. c. max.	155—160	..	3 15 0
489,200	Stk.	,,	5	Do. do. 5 p. c. Prf.	168—172	..	2 18 2
1,019,585	,,	Apl. 15	4	Do. 4 p. c. A Db. Stk.	141—144	..	2 15 7
1,155,066	Stk.	June 10	10	West Middlesex	297—302	..	3 6 3
200,000	,,	,,	4½	Do. 4½ p. c. Db. Stk.	162—165	..	2 14 7
200,000	,,	Mar. 11	3	Do. 3 p. c. Db. Stk.	104—106	..	2 16 7
					* Ex div.		

† Next dividend will be at this rate.

The Dunbar Gas Commissioners have reduced the price of gas from 5s. 5d. to 4s. 7d. per 1000 cubic feet. The Convener of the Gas Committee (Bailie Smith) said that they were able to do this because last year they had a balance of £150, and a surplus of coal. Provided all went well, they might be able to make a further reduction later.

The North Berwick Gas Commissioners have been able to pay their way during the past year, a result which, the Town Clerk observed at a meeting on Monday, was very satisfactory when they considered the abnormal expenditure to which they had been put.

The Peterhead Gas Commissioners held their annual meeting on Monday. The Convener of the Commissioners (Provost Smith) had not a very rosy account to give of the year's working, as it had resulted in a deficit of £38. He explained, however, that they lost £600 of revenue by the sweeping reduction in the price of gas of 9d. per 1000 cubic feet, made last year. The consumption of gas was 18,733,100 cubic feet—a decrease of more than 1 million cubic feet. This was, he believed, owing to a large extent to less gas being required in the prison (the number of convicts having been greatly reduced), to the stoppage of a factory, and to the failure of the herring fishing. The accounts were adopted; and the price of gas was continued at 4s. 3d. per 1000 cubic feet. As to the diminished consumption of gas, it does not surprise me. I anticipated, some months ago, that in many places there must, on account of the exceptionally fine weather of last winter and spring in Scotland, be a diminished consumption of gas; and I now find that I was right. Such another fine season cannot be expected this year, and consequently estimates need not be cut down in the belief that the reduction is to be permanent. I observe that in Peterhead they have estimated for a consumption of 20 million cubic feet this year, which is an indication that the Commissioners are hopeful of the immediate future.

At a meeting of the Broughty Ferry Police Commission on Monday, the estimates and accounts for the Gas Department were submitted. The estimated consumption for the current year is stated at 39,134,100 cubic feet, which, at last year's rates, will yield a net revenue of £5478. The consumption for the year ending May was 36,558,427 cubic feet; resulting in a net revenue of £5121—the estimate having been £4757. The total revenue of the department is estimated for this year at £6766. Last year the estimate was £5856, and the actual revenue £6429. The probable expenditure for the current year figures out at £6743; showing an apparent surplus over expenditure of £23. Last year the estimated expenditure was £5847, and the actual payments were £6319. The Commissioners adopted the accounts, and fixed the price of gas at 2s. 11d. per 1000 cubic feet—the same as last year. Satisfaction was expressed at the management of the works by Mr. A. Waddell.

The net profits of the Jedburgh Gas Company for the past year amounted to £481, out of which a dividend at the rate of 7s. 6d. per £6 share has been paid. The Bridge of Weir Gas Company have paid a dividend at the rate of 5 per cent., and have reduced the rent for meters. The Douglas Gas Company have paid a dividend at the rate of 5 per cent., and have lowered the price of gas by 10d. per 1000 cubic feet. The Johnstone Gas Company have reduced the price of gas from 3s. 6½d. to 3s. 4d. per 1000 cubic feet.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 16.

Sulphate of Ammonia.—There has been a better market, with a hardening tendency, especially in Scotland. In the early part of the week, considerable sales were made at £9 2s. 6d. per ton f.o.b. Leith; but at the close the quotation is firm at £9 5s. per ton. A limited quantity was available f.o.b. Liverpool; and the value remained at £9 6s. 3d. to £9 7s. 6d. per ton. There has been a fair amount of direct inquiry. But consumers have hesitated to pay the prices; and the bulk of the buying has been for covering purposes. In the forward position, makers are firm at £9 10s. per ton f.o.b. Leith, delivery up to the end of the year; but there has been speculative offering abroad at the equivalent of about 2s. 6d. per ton less. Beckton quotation remains at £9 7s. 6d. per ton, Beckton terms, July-September delivery.

Nitrate of Soda, owing to further arrivals, is rather easy on spot at 7s. 4½d. per cwt. for good up to 7s. 6d. per cwt. for refined quality. In the forward position, however, the market is firm.

LONDON, July 16.

Tar Products.—Business continues dull and uninteresting. Very low and unprofitable figures are reported in respect to anthracene contracts in Germany. It is quite certain, however, that, at the prices mentioned, English tar distillers will not take the trouble to extract it from their oils. The smaller producers, however, in this country, have taken fright, and are disposing of any little stocks they may have at ridiculous prices. Anthracene is an important factor in the value of tar on the east and south coasts. The present outlook is a source of great anxiety to those manufacturers who have their tar purchased on the basis of former values of anthracene. Benzol and naphthas continue languid; and quotations are, generally speaking, only nominal. There is an undefined sense of hope respecting pitch for next season's delivery. It is felt that the close of the Welsh coal strike, which has so long prevented fuel making in that district, added to increased consumption abroad, may make pitch scarcer than is anticipated. There are, at the present time, no great stocks in makers' hands.

Values during the week may be taken as follows: Tar, 11s. 6d. to 15s. Pitch, east coast, 23s. 6d.; west coast, 18s. 6d. Benzols, 90's, nominal, 10d.; 50's, 10d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 1½d. Crude, 30 per cent., naphtha, 4½d. Creosote, 2⅝d. Heavy oils, 45s. Carbolic acid, 60's, 2s. Naphthalene, 55s.; salts, 32s. 6d. Anthracene, nominal, "A," 4½d.; "B," 3½d.

Sulphate of Ammonia.—The week closes with a steadier market; and somewhat better prices. There is a good inquiry for forward delivery; but buyers offer no inducement on current quotations. It is difficult to forecast this market. But, undoubtedly, stocks are low; and the consumption generally is greater. The lessened production of sulphate at gas-works where water gas is made is of a marked character. To-day's value is £9 5s. to £9 7s. 6d. per ton, less 3½ per cent. at all ports.

NOTICE OF REMOVAL.

JOHN WRIGHT & CO., LIMITED,

Have removed their

London Show-Rooms

from 105, Cheapside,

TO MORE COMMODIOUS PREMISES AT

19 & 21, QUEEN VICTORIA STREET, E.C.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business continues to move on in a very steady, satisfactory fashion, with a strong tone maintained as regards prices for current sales. On contracts there is a general advance over last year's low figures, of about 3d. to 5d. per ton on engine fuel, and 6d. to 9d. per ton on round coal. In some cases colliery proprietors, in arranging their contracts for the ensuing twelve months, are putting on a special advance of 2d. per ton to cover the extra cost of the Workmen's Compensation Act, and are either introducing a sliding clause regulating the price according to wages—representing an advance of about 3d. per ton on slack, up to 5d. on round coal, for every 5 per cent. advance in wages—or making a direct advance sufficient to cover what they consider the prospective upward move in wages. Generally forward contracts are being settled on pretty much the above basis, both in house-fire qualities, steam and forge coal, and engine fuel. With regard to gas coals, the position remains much as last reported. The contracts that are now being closed are generally at advances ranging from 3d. per ton where some advance was obtained last year, up to 6d. where minimum prices were taken on last season's contracts. The better qualities of round coal are just now only in limited request, and are accumulating in stock, with pits running four to five days per week. It is, however, only in very exceptional cases where there is any giving way upon what have been current quotations for some time past. Common round coals meet with a ready sale for steam and forge purposes, with no excess of supplies offering in the market. Prices are very firm; good ordinary qualities not being obtainable under about 7s. per ton at the pit mouth. At many Lancashire collieries the present output of slack is scarcely sufficient to meet the requirements of customers; but there are fairly ample supplies coming in from other districts, so that there is no actual scarcity in the market. Here and there some hardening up on current quotations at the Lancashire collieries is spoken of; but generally prices are not more than steady at the full rates that have been ruling recently—averaging 3s. 3d. to 3s. 6d. per ton at the pit for common, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 5s. for best sorts. A brisk demand still comes forward in the shipping trade; and 8s. 6d. to 8s. 9d. per ton is readily obtained for good ordinary qualities of steam coal delivered at ports on the Mersey, with quotations still as high as 9s. to 9s. 3d. per ton in special cases.

Northern Coal Trade.—There has been increased activity in the coal trade of the North; and fuel supplies have grown rather scarce. This is partly due to the prolongation of the strike in Wales, and partly to the fact that this is the season of the heaviest shipments of coal from the ports of the Tyne and the Wear, and from West Hartlepool. Prices of best Northumbrian steam coals are firmer, at 13s. 6d. per ton f.o.b.; second-class steam coals are about 12s. 6d.; and steam smalls, 5s. 9d. For this time of the year, the demand for gas coals is abnormally heavy; and as the output is rather reduced by the local and colliery holidays, the prices are rather higher. Best Durham gas coals may be quoted at about 9s. per ton f.o.b. for occasional cargoes; and as it would seem that the range of prices is likely to be permanently higher, those companies who have made their contracts early this year have evidently done well. One or two large local contracts for gas coals are now in course of negotiation. There is no alteration in the price of manufacturing coals, but the demand seems a little stronger. Gas coke is rather steady; but still some of the inland gas companies have good stocks. At the shipping ports, the stocks of gas coke are small.

Scotch Coal Trade.—The West of Scotland was on holiday last week, and trade was so paralyzed that it is impossible to give a description of it, either as to volume or prices, which would be at all reliable. The shipments during the week amounted to 247,190 tons—a decrease (which was altogether due to the state of trade in the West) of 6529 tons, when compared with the preceding week, but an increase of 63,462 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,798,661 tons—an increase on the corresponding period of last year of 870,881 tons.

The Swansea Corporation and the Gas Company.—At a meeting of the General Purposes Committee of the Swansea Corporation last Wednesday, a Sub-Committee's report was introduced recommending that the appeal by the Corporation against the injunction obtained by the Gas Company, under circumstances already reported, should be prosecuted. The Mayor said the expense of testing the point, which was most important to municipal corporations, would not be more than £200. Several members argued that the Municipal Corporations Association was the proper body to prosecute such an appeal. It was, however, decided to give the Sub-Committee power to go on.

Holyhead and North Wales Gas and Water Company.—The second ordinary general meeting of this Company was held at the Queen Hotel, Chester, on the 9th inst.—Mr. W. Jackson presiding. The report presented stated that the profit on the trading account for the year amounted to £4085—being an increase of £963 on the previous year; and the net balance was £1885. The Directors had secured, near Llandudno Junction, a site for treating their tar and ammoniacal liquor; and the necessary works were in course of construction. On the advice of their Engineer (Mr. Saville), they had adopted a system of profit-sharing with the Managers of the several works. An interim dividend at the rate of 6 per cent. per annum for the six months ending Sept. 30, 1897, had already been paid. The increase on the revenue account had been caused principally by the decrease of the leakage in the various districts and by the increased sale of gas, which, on the whole, was about 18·7 per cent. One satisfactory feature in the accounts was that though the quantity of gas made was so much in excess of previous years, the cost of coal was only £180 more than in the preceding year. It was reported at the meeting that the price of gas in five of the places served by the Company had been reduced considerably; showing that the concern was in a most healthy state. An interim dividend at the rate of 6 per cent. per annum for the six months ending the 31st of March was declared.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. Telegraphic Address: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
ROCHESTER	500,000 Cubic Feet.
TORONTO (Second Contract; Remodelled)	2,000,000
MONTREAL	500,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,00

Reductions in Price.—The Chesterfield Gas and Water Board have decided to reduce the price of gas for power purposes to 2s. 6d. per 1000 cubic feet. The Directors of the Glossop Gas Company have reduced the price of gas from 3s. 10d. to 3s. 6d. per 1000 cubic feet.

The Bankruptcy of Mr. W. Peed.—The Trustee in the above-named matter (Mr. Tansley Witt) has given notice that a dividend of 1s. in the pound has been declared. The claims expected to rank will amount to about £177,500; but the total cannot be definitely stated.

Boston Gas Company.—At the annual meeting of this Company last Friday, a report was presented showing that the receipts amounted to £11,158, and the payments to £8200—leaving a profit balance of £2958. In February last an interim dividend was paid at the rate of 4¼ per cent. and 3¼ per cent. respectively, on the old and new shares; and it was agreed to pay the balance of the statutory dividend.

Sale of Shares.—Messrs. Brackett and Sons have just disposed of nine lots of consolidated ordinary stock of the Tunbridge Wells Gas Company (paying 11½ per cent.), at £270 per £100 share. Eight lots of consolidated "B" stock, paying 9 per cent., fetched £210 per £100 share; a similar number of lots of consolidated "C" stock, paying 8⅓ per cent., sold at from £190 to £192 per £100 of stock; and four lots of "D" stock, paying a similar rate of interest, realized the same price. Five lots of 4½ per cent. gas debentures sold at £127 per £100; another lot fetching £128. There was keen competition for the lots.

Serious Fire at Messrs. Richmond and Co.'s Warrington Works.—A large fire occurred at the Warrington works of Messrs. Richmond and Co. at five o'clock last Sunday morning. It burnt for six hours, and was smouldering yesterday morning. Fortunately the fire was confined, by means of sprinklers, to the warehouse and showroom on the north side of Academy Street. There has been damage to the extent of £20,000; but it is fully covered by insurance. Complete arrangements have already been made for carrying on the business without interruption. Temporary offices having been fitted up, the men were all at work yesterday morning as usual.

Proposed Extension of St. Mary Church Gas-Works.—A report recommending certain alterations and extensions of the gas-works was presented at the meeting of the St. Mary Church Urban District Council last Thursday. The Manager (Mr. T. Evans) had visited the Exmouth, Torquay, and Paignton Gas-Works with the Chairman of the Gas Committee (Mr. W. H. Grant). Mr. Willey, of Exeter, had also been consulted, and recommended that the Committee should purchase certain plant from Exmouth, and Mr. Evans advised the renovation of various parts of the machinery and the erection of new tar and ammoniacal liquor tanks, which would, he said, be an effectual remedy against all leakage and nuisance. The report was adopted, and Mr. Grant and Mr. Evans were thanked for their services. It was decided to ask Mr. Willey to report on the Manager's recommendations.

Yeovil Gas and Coke Company, Limited.—In the report to be presented to the proprietors of this Company at their meeting next Monday, the Directors announce the result of the proceedings in Parliament in the present session, by virtue of which the Yeovil Corporation obtained power to purchase the Company's property; the shareholders' interests being, however, fully protected. For parliamentary purposes the Directors were advised to have the accounts for the past three years re-arranged in the form required by the Gas-Works Clauses Act, 1871; and the form of balance-sheet prescribed has been adopted for circulation among the shareholders. The profit for the year ending June 30 amounts to £3083, from which the Directors recommend a dividend of 5 per cent.; making with the interim dividend of 5 per cent. the usual 10 per cent. for the year. The alterations and extensions required by the increase of the Company's business have been successfully completed, and proved to be of great service during the past winter. The works, under the supervision of Mr. E. Howell, have been maintained in good order.

Tiverton Corporation Gas-Works.—The accounts of the Tiverton Corporation Gas Department for the year ended the 31st of March show that the capital expenditure has now reached a total of £21,031, and there is an unexpended balance of £968, which is to be employed in the provision of a new holder. The make of gas last year was 27 million cubic feet, of which 20 million cubic feet were sold by meter, and nearly 5 millions used for public lighting; the unaccounted-for gas being 6·2 per cent. of the make. The total receipts were £6665; and the manufacturing and other charges came to £5049—leaving a balance of £1616 to be carried to the profit and loss account. After deducting interest and sinking fund, there is a net balance of £198, which is added to the reserve fund. Mr. J. Siddalls, the Borough Accountant, states in his report that the net profit of the three years' working since the undertaking was acquired by the Corporation amounts to a total of £2347, which has been placed to the reserve fund, and will provide working capital. There are 141 gas-stoves on hire; and Mr. Siddalls says this business has been stimulated by exhibitions of gas-stoves as well as by the reduction of the price of gas for cooking purposes to 3s. 6d. per 1000 cubic feet.

Extension of the Profit-Sharing System by Messrs. Richmond and Co.—The employees of Messrs. Richmond and Co., Limited, at Stratford, held their first annual outing last Saturday, at Rye House. The party numbered more than 100, and included, among others, Mr. E. W. T. Richmond, the Chairman and Managing-Director of the Company, and Mrs. Richmond; Mr. H. M. Thornton (the London Director) and Mrs. Thornton; Mr. H. E. Ransome (the Warrington Director), with other officials and foremen. The party left Stratford in waggonettes at 8.30 a.m., and Rye House was reached about noon. Dinner was served in the large hall attached to the grounds. In the after-dinner proceedings, Mr. Richmond, on behalf of the employees, presented to Mr. and Mrs. Thornton, a Bechstein upright grand piano, as a token of goodwill, on their recent marriage, Mr. Thornton responding in a happy speech. Mr. Richmond, amid loud cheers, announced that from the 1st inst. the profit-sharing system, as adopted at Warrington, would be put into operation at Stratford. He briefly explained the system, and said he felt sure his Board were doing the right thing in encouraging the employees to become shareholders in the concern for which they worked. Athletic sports occupied the afternoon; and the party returned to Stratford after a splendid day's outing.

"To roast or grill,
To bake or boil;
Use Richmond's Stoves,
They'll save you toil."

"For comfort you'll find
Richmond's 'Model' the best;
You turn on the gas,
The stove does the rest."

"A 'Richmond' I wanted,
A 'Richmond' I've got;
Now peaceful my days,
And happy my lot."

"'Richmond's' Stoves for wear and tear
Nothing can surpass;
They all excel: they cook so well,
And burn so little gas."

Messrs. W. C. Holmes and Co., of Huddersfield and London, have been entrusted with an order for one of their patent "New" scrubber-washers, to be erected at the Falmouth Gas-Works.

The New Conveyor Company, Limited, of Smethwick, having had to run their workshops for some months night and day on double shifts, and being still unable to meet the demand for their coal and coke handling specialities, have decided to duplicate their present workshops and machinery.

Messrs. Richmond and Co.'s "Picture Puzzle" competition, to which attention was called in the "JOURNAL" for the 21st ult., bids fair to be as successful as their "Motto" or "Couplet" competition; about 2200 forms having been received in the first week. The prizes, of which there are upwards of 170, will be awarded on the 1st prox.

New tube-works are about to be erected at Coatbridge on a site close to the two competitive systems of the Caledonian and North British Railways. The Company starting the works—to be known as the Clydeside Tube Company—will include two gentlemen who have for many years been closely identified with the firm of Messrs. A. & J. Stewart and Clydesdale, Limited, which was some time ago merged with Messrs. Menzies and Co., and is now known as A. & J. Stewart and Menzies, Limited. The Clydeside Tube Company intend to make a speciality in solid drawn tubes, as well as the higher class of welded tubes.

The New Conveyor Company, Limited, of Smethwick, have received instructions to proceed with a contract which is practically a complete new gas-works for the Dudley Gas Company. It consists of a new retort-house building, with an installation of retorts and all the automatic machinery; also engine and boiler-houses, with duplicate engines, exhausters, boilers, scrubbers, washers, and tar and liquor tanks. The regenerative furnaces will be bonded on an improved principle recently introduced by the Company, which they claim to be an effective method of adding to the life of the furnace itself, and ensuring good steady heats on inclined retorts.

Messrs. R. Laidlaw and Son, of Edinburgh and Glasgow, have received the contract to supply the Gas Department of the Glasgow Corporation with meters, so far as two-thirds of them are concerned; and Messrs. James Milne and Son, also of Edinburgh and Glasgow, have taken the contract for the other portion. Both contracts apply to the financial year which commenced on the 1st of June. The contract for the fire-bricks and fire-clay required during the year by the Gas Department has been divided equally between the Glenboig Union Fire-Clay Company and Messrs. P. & M. Hurll, whose works and fire-clay mines are situated close by the Glenboig Company's works.

Messrs. Willey and Co.'s employees had their annual outing last Saturday week, when 250 went by special train from Exeter to Ilfracombe, and spent a thoroughly enjoyable day. At the Town Hall, where the party assembled for dinner, Mr. H. A. Willey presided; and in the course of a speech in response to the toast of "Success to the Firm," said that, irrespective of the number of men associated with them, there were from 1500 to 2000 persons really dependent upon the industry they carried on in Exeter. It was, therefore, a matter of no surprise that, on a recent occasion, the public mind was exercised in view of a very large and important undertaking being sent elsewhere. For this most unfortunate circumstance he was not in the remotest degree responsible; and time would show that the action he took up was a perfectly correct one. The toast of "The Visitors" was responded to by Mr. J. Thomas, Secretary to the Plymouth Gas Company; Mr. C. Ball, Secretary to the Ilfracombe Gas Company; Mr. R. Beynon, Engineer and Manager of the Torquay Gas Company; and Mr. J. F. Foster, Secretary and Manager of the Exmouth Gas Company.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S "VOLCANIC" and "VOLCUM" CEMENT. Fire Resistance up to 4500° Fahr. In use in Gas-Works all over the World.

ANDREW STEPHENSON,
182, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

Telegrams: "Volcanism, London."

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "SADLER, MIDDLESBROUGH."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see July 5, p. 73.]

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1769.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E., and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

TO GAS AND WATER OFFICIALS.

SPECIALLY favourable terms for Cycles. First-Class Workmanship and Material guaranteed. Art Catalogue post free.
MELROSE CYCLE COMPANY, COVENTRY.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS and WAKEFIELD.

WATER-GAS PLANT.

ENGINEERS contemplating the above are invited to communicate with the Advertiser, who is prepared to give every assistance in designing Plant of any capacity.
J. L. FEATHERSTONE, 80, Amesbury Avenue, STREATHAM HILL.

GWYNNE & BEALE'S

PATENT

GAS-EXHAUSTERS AND STEAM-ENGINES

FOR FULL PARTICULARS, APPLY TO THE MAKERS:

GWYNNE & CO.,

Telegrams:
"GWYNNEGRAM, LONDON."

HYDRAULIC AND GAS ENGINEERS

Telephone
No. 95 Holborn.

(Late Essex Street Works, Victoria Embankment, London),

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

IMPORTANT.

OLD Retorts made equal to new by repairing them with CROWTHER'S PATENT STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Can be used in Hot or Cold Retorts; and "A1." for Mouthpiece Joints. Satisfaction Guaranteed.

CROWTHER, Practical Retort Setter, Manor Street, HUDDERSFIELD.

GAS TAR wanted.

BROTHERTON AND Co., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

ENRICH YOUR GAS
WITH
CHEAP BENZOL.

AT to-day's Price of Benzol, Illuminating POWER cost less than a HALFPENNY PER CANDLE.

Apply to SADLER AND Co., MIDDLESBROUGH.

SPENT OXIDE wanted.

BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

TRAVELLER, representing a Firm of Fire-Clay Retort and Brick Manufacturers, covering North and South Wales, Eastern Counties, Midlands, Shropshire, &c., during Six Months of the Year, will be pleased to hear from Firms desirous of being represented. Is open to extend ground covered.

Address No. 3093, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMEN. Good Men, with Brains, wanted.

Apply to the NEW CONVEYOR COMPANY, LIMITED, Gas Engineers and Millwrights, SMETHWICK.

WANTED, capable Man, with thorough knowledge of Glass and Chandelier Trade. Accustomed to Office Work.

Apply, by letter, to NEW INCANDESCENT GAS LIGHTING COMPANY, LIMITED, 34, SHOE LANE, E.C.

WANTED, a Stoker in small Gas-Works (Night Shift), and to take short Lamp-Lighting Round. Must be willing to make himself generally useful. Wages 21s. per week.

Address W. C. BURLEY, Station Road, PETERSFIELD.

WANTED, two good Gas Stokers, used to Shovel Charging. Wages 28s. per week. Permanent employment for steady Men. Good Character indispensable.

Apply to THOS. E. SHADBOLT, Manager, Gas-Works, GRAYS.

MANAGER of Water-Works wanted. One accustomed to Atkinson's Filtering Plant, and to take sole charge.

Apply, by letter, to SECRETARY, Barton-on-Humber Water Company, Limited, 4, Tokenhouse Buildings, LONDON, E.C.

RETORT-HOUSE Foreman wanted. Preference given to one understanding Regenerative Furnaces and able to control Men. Wages £2 2s. per week.

Apply, by letter, to No. 3093, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas Stoker, used to Charging with Shovel, and attending to Engine and Exhauster. Wages 37s. 4d. and 33s. per week of seven and six days respectively. Permanency to a steady and active Man.

Apply, by letter, to No. 3100, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, an under Stoker, used to Shovel Charging, and willing to make himself generally useful. Must be steady, and have good character.

Apply, by letter, stating Age, Wages required, and *copy* of Testimonial from last employer, to GAS-WORKS, Seaford, SUSSEX.

WANTED, in a large Gas Engineering Establishment in the Midlands, a good Draughtsman, well up in the construction of modern Gas Plant, and one who is well able to take out quantities for estimating, quickly and accurately, for Gasholders, Purifiers, and Gas Plant generally.

Apply, by letter, stating Age, Experience, Salary required, and any other Particulars, to No. 3097, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS CARBON Wanted, not less than 4-Ton Loads.

Apply to the BRIMINGTON CARBON COMPANY, Bowerby Bridge, YORKS.

QUEENSTOWN GAS COMPANY.

MANAGER WANTED.

THE Directors of the Queenstown Gas Company will, at their Meeting on the 26th of July inst., receive APPLICATIONS from persons competent to fill the position of MANAGER of their Works. Age not to exceed 40 Years. Salary £100 per annum, with House free of Rates, Garden, Fuel, and Light.

The person appointed will be required to give solvent security to the extent of £200.

Applications, stating Experience, with *copies* of Testimonials, to be sent to the Secretary, 2, Harbour Row, Queenstown, so as to reach him not later than Twelve o'clock noon, on Tuesday, the 26th of July, 1898.

By order,
JAMES WILSON,
Secretary.

Office of Queenstown Gas Company,
2, Harbour Row, Queenstown,
July 14, 1898.

WANTED, Carbon in 4 Ton Lots, or more; also OIL CARBON.

State Price, f.o.r. at nearest Station, to No. 3081, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS AND WATER STOCKS AND SHARES.

WANTED, to purchase, quoted or un- quoted SECURITIES.

Send Particulars and lowest Cash Price to SECRETARY, London and Midland Trust Company, Coleman Street, LONDON, E.C.

WANTED, to Purchase, a good Second- hand TOWER SCRUBBER, with inside Boards and all necessary Connections and Valves, about 25 feet high by 5 or 6 feet diameter.

Address No. 3099, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TWO Waller Exhausters to Sell, 8000 and 15,000 cubic feet per hour, with Valves, &c., in good working order. Cheap to immediate purchasers.

Address No. 3035, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—One small Gas Exhauster, combined with Steam-Engine, and one without Engine. Both perfectly new, and of the very best Design and Workmanship.

SELLERS PICKERING AND Co., Gas Engineers, Ravensthorpe, YORKS.

FOR SALE—A Second-hand (thoroughly overhauled) Vertical PUMP EXHAUSTER, with Steam-Engine (with clean Water and Liquor Pumps attached), to pass 7000 cubic feet of Gas per hour.

Apply to R. DEMPSTER AND SONS, LIMITED, Elland, YORKS.

PURIFIERS, set of Four, 12 feet square, modern make, perfect condition, 12-inch Centre Valve and Connections. Bargain, if sold this month. Sold in pairs, with 12-inch Four-way or ordinary Slide Valves, if required.

Apply, by letter, to No. 3096, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

EXHAUSTERS, pair (Donkin's) 25,000 cubic feet per hour, FOR SALE, with Engine, and four 8-inch Valves, in perfect order, £100. Sold separately, if desired.

Other sizes, new and second-hand, from 2000 to 50,000 cubic feet per hour, ready for delivery.

J. F. BLAKELEY, Gas Engineer, Ravensthorpe, Yorks.

FOR SALE—One (nearly new) Waller's Patent Three-Blade Beale improved GAS EXHAUSTER, 12 in. diam. by 12 in. long, with tight and loose Pulleys, capable of exhausting 5000 cubic feet per hour.

For Price, &c., apply to G. S. DE RITTER, 33, Three Colt Street, LIMEHOUSE, E.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.**

J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

FOR SALE, Cheap—The under- mentioned GAS PLANT:—

2 PURIFIERS, 8 ft. square by 4 ft. deep, complete.
2 PURIFIERS, 5 ft. square by 4 ft. deep.
1 PURIFIER, 5 ft. square by 2 ft. 9 in. deep.
CONDENSER, 4 inches diameter, Vertical Pipes.
EXHAUSTER (Gwynne's), 20,000 c. f. per hour.

Apply to SAML. WHILE AND SONS, 60, QUEEN VICTORIA STREET, E.C.

CITY OF HEREFORD.

THE Gas Management Committee of the Corporation invite TENDERS, from Colliery Proprietors only, for the supply of best screened large GAS COAL and Scotch CANNEL for One Year from the 1st of August next.

Full Particulars and printed Forms of Tender may be obtained on application to the undersigned.

Tenders, endorsed "Tender for Gas Coal and Cannel," are to be sent in, addressed to the Chairman, Gas Management Committee, Mansion House, Hereford, by Saturday, July 23.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM PARLBY,
Gas Engineer and Manager.

Gas-Works, Hereford,
July 12, 1898.

WYE GAS AND COKE COMPANY, LIMITED.

TENDERS are invited for the supply of 300 Tons of GAS COAL, delivered to Wye Station, S.E.R., in such quantities and at such times as the Company may direct between Aug. 10, 1898, and June 30, 1899.

Tenders, sealed and endorsed "Coal," to be delivered on or before Saturday, July 30, 1898, to me at Church Street, Wye, Kent.

W. LEWIN,
Secretary.

HUNSTANTON GAS-WORKS.

CONTRACT FOR GASHOLDER TANK.

THE Urban District Council of New Hunstanton are prepared to receive TENDERS for the construction of a TELESCOPIC GASHOLDER.

Drawings may be seen and copies of the Specification and Bills of Quantities obtained on and after Wednesday, the 20th of July inst., at the Offices of the Council, Hunstanton, or at the Office of the Engineers (Messrs. Stevenson and Burstal), 38, Parliament Street, Westminster, S.W., on payment of One Guinea, which will be returned upon receipt of a *bonâ-fide* Tender, and copies of the Drawings may be obtained of the Engineers on payment of a further One Guinea.

Sealed Tenders, endorsed "Tender for Gasholder," are to be forwarded to the undersigned not later than Saturday, the 30th of July inst.

J. S. B. GLASIER,
Clerk.

Hunstanton, July 16, 1898.

COUNTY BOROUGH OF SALFORD.

THE Gas Committee are prepared to receive TENDERS for the supply and erection of CAST-IRON COLUMNS, STEEL GIRDERS, &c., for Purifying and Oxide Floors at their Liverpool Street Gas-Works.

The Drawings may be seen and Copies of the Specification and Form of Tender obtained (for which a charge of One Guinea will be made, to be returned on receipt of a *bonâ-fide* Tender), by applying to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Purifying Floors," addressed to the Chairman of the Gas Committee, to be delivered to me not later than Three p.m., on Wednesday, the 3rd of August, 1898.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
SAML. BROWN,
Town Clerk.

Town Hall, Salford,
July 16, 1898.

BOROUGH OF BURTON-UPON-TRENT.

NEW RETORT-HOUSE.

CONTRACT No. 17.

THE Corporation of Burton-upon-Trent invite TENDERS from competent persons for the construction and erection of a new RETORT-HOUSE and the execution of certain Works incidental thereto, at their Gas-Works in the said Borough.

Full Particulars and Copies of Conditions, Specification, and Bill of Quantities, with Form of Tender, may be obtained and Drawings inspected on payment of Two Pounds (which will be returned on receipt of a *bonâ-fide* Tender), on application to the Engineer, Mr. F. L. Ramsden, Gas and Electric Light Works, Burton-upon-Trent.

Sealed Tenders, endorsed "Tender for Retort-House," are to be delivered to me at or before Ten a.m. on Friday, the 29th day of July inst.

The Corporation do not bind themselves to accept the lowest or any Tender, nor will they pay any expense or charge relating to the making or delivery of the same.

No Tender will be accepted from any party who pays to his or their employees, whether artizans or labourers, less than the Standard Rate of Wages paid in this Borough, or who does not conform to the Hours and Conditions of Labour generally recognized in each branch of industry affected; and clauses to ensure compliance with this regulation are inserted in the conditions of contract.

T. N. WHITEHEAD,
Town Clerk.

Town Hall, Burton-upon-Trent,
July 14, 1898.

BOROUGH OF BURTON-UPON-TRENT.

NEW RETORT-HOUSE ROOF.

CONTRACT No. 18.

THE Corporation of Burton-upon-Trent invite TENDERS from competent persons for the supply, construction, erection, and fixing of a New RETORT-HOUSE IRON ROOF at the Gas-Works in the said Borough.

Full Particulars and Copies of Conditions, Specification and Bill of Quantities, with Form of Tender, may be obtained and the Drawings inspected on payment of Two Pounds (which will be returned on receipt of a *bonâ-fide* Tender) on application to the Engineer, Mr. F. L. Ramsden, Gas and Electric Light Works, Burton-upon-Trent.

Sealed Tenders, endorsed "Tender for Iron Roof," are to be delivered to me at or before Ten a.m. on Friday, the 29th day of July inst.

The Corporation do not bind themselves to accept the lowest or any Tender, nor will they pay any expense or charge relating to the making or delivery of the same.

No Tender will be accepted from any party who pays to his or their employees, whether artizans or labourers, less than the Standard Rate of Wages paid in this Borough, or who does not conform to the Hours and Conditions of Labour generally recognized in each branch of industry affected; and clauses to ensure compliance with this regulation are inserted in the conditions of contract.

T. N. WHITEHEAD,
Town Clerk.

Town Hall, Burton-upon-Trent,
July 14, 1898.

THE Directors of the Minster Gas Company invite TENDERS for the supply of 400 Tons of best GAS COAL, to be delivered free at Minster Station, S.E. Railway, in quantities of about 70 Tons at a time, as required.

Tenders to reach the Office on or before Wednesday, the 27th of July.

M. HODGES,
Secretary.

Minster, Thanet.

OSWALDTWISTLE URBAN DISTRICT COUNCIL.

THE Gas Committee invite Tenders for the TAR and LIQUOR produced at their Works for One Year from the 31st day of July, 1893.

The quantity of Coal carbonized is about 3700 Tons.

Further Particulars may be obtained from the Manager, Gas-Works, Church, near Accrington.

Tenders, endorsed "Tender for Tar," to be addressed to me, and to be delivered not later than Wednesday, the 27th of July.

WM. SANDEMAN,
Clerk.

District Council Offices,
Oswaldtwistle, July 6, 1898.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of the late G. E. Wood, Esq.

IMPORTANT SALE OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, E.C., on Monday, July 25, 1898, at Two for half-past Two o'clock, in Lots, STOCKS AND SHARES as follows:—

WALTON-ON-THAMES AND WEYBRIDGE GAS COMPANY.—£1480 DEBENTURE STOCK and 200 £10 "A" and "B" SHARES.

HAMPTON COURT GAS COMPANY.—£1000 DEBENTURE STOCK and 140 £10 "A" and "B" SHARES.

PETERSFIELD GAS COMPANY, LIMITED.—100 £5 SHARES.

KINGSTON-ON-THAMES GAS COMPANY.—£100 DEBENTURE STOCK and three £50 SHARES.

WEST SURREY WATER COMPANY.—86 £10 SHARES.

SUNBURY GAS CONSUMERS' COMPANY.—68 £5 SHARES.

WOKING DISTRICT GAS COMPANY.—50 £5 SHARES.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

TO CAPITALISTS AND OTHERS.

SWANSEA, GLAMORGANSHIRE.

MESSRS. JOHN M. LEEDER & SON have received instructions from the Directors of the Swansea Gaslight Company to offer FOR SALE by Public Auction, at the Royal Hotel, High Street, Swansea, on Friday, the 22nd day of July, 1898, at 2.30 for 3 o'clock precisely in the Afternoon

£30,000 NEW ORDINARY STOCK, 1898,

in the Swansea Gaslight Company, in 250 Lots of £100 and £50 each respectively; being part of the Additional Capital of the Company authorized to be raised by the Swansea Gas Act, 1898, and pursuant to the Provisions and Conditions therein contained.

The Consolidated Stock 1898 and the New Ordinary Stock 1898 are entitled to receive Dividends at the rate of £5 in respect of every £100 of such Capital authorized by the Act; and such Stocks rank equally with each other in all respects.

Purchasers of this Stock will be entitled to receive Dividends as from the 1st day of July inst.

Particulars and Conditions of Sale containing all necessary Information may be obtained on application to the AUCTIONEERS, at their Offices, Goat Street Chambers, SWANSEA, or of THORNTON ANDREWS, Esq., Secretary and Manager to the Swansea Gaslight Company, Oystermouth Road, SWANSEA.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Bridge House Hotel, London Bridge, in the Borough of Southwark, on Wednesday, the 10th day of August next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June last, and to declare a Dividend for the same period.

Notice is Hereby also Given, that immediately after the conclusion of the Business of the Ordinary Meeting, an EXTRAORDINARY OR SPECIAL GENERAL MEETING will be held for the consideration of a Scheme enabling employees holding Ordinary Stock of the Company to elect Directors, pursuant to the Provisions of the South Metropolitan Gas Acts, 1896 and 1897.

The TRANSFER BOOKS WILL BE CLOSED from the 27th day of July, until after the Meeting.

By order,
FRANK BUSH, Secretary.

Offices: 709A, Old Kent Road, S.E.,
July 16, 1898.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 5th day of August, 1898, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend for the same period, and for general purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 21st day of July, until after the Meeting.

By order of the Board,
CHARLES M. OHREN, Secretary.

Offices and Works:
Lower Sydenham, S.E.,
July 15, 1898.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices, No. 63, Chancery Lane, in the County of Middlesex, on Friday, the 12th day of August, 1898, at Half-past Three o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for Half Year ended the 30th of June last, to declare Dividends, to consider notice of motion given at the Half-Yearly Meeting held on the 25th day of February last, as follows:—"That at the next General Meeting of Proprietors, the remuneration of the Auditors for their services be increased;" and to transact the Ordinary Business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 30th of July to the 12th of August, both inclusive.

By order of the Board,
S. J. WILLIAMS,
Secretary.

Offices: 63, Chancery Lane,
London, W.C., July 18, 1898.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.
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Illuminating Power	16·4 candles.
Coke	68 per cent.

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W. RICHARDSON, Fitter.

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FROM THE
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Available output up to 5000 tons per day.
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HIGH-CLASS FIRE-BRICKS, acknowledged to be the best obtainable for
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To be given for the best Essay on the following subject:—
"THE UTILITY OF SULPHATE OF AMMONIA IN AGRICULTURE."
The subject to be treated from a practical and scientific point of view.

The Committee has secured the services of Mr. William C. Little, Member of the late Royal Commissions on Agriculture, and Dr. Voelcker, Consulting Chemist to the Royal Agricultural Society of England, to act as judges of the essays sent in. In the event of any difference arising, Mr. Samuel Rowlandson, a Member of the Council of the Royal Agricultural Society of England, will act as referee.

The essays must be in the English language, and written on one side of the paper only; they must further bear a distinguishing motto or *nom de plume*, but not the names of the authors.

Each author, when sending in his essay, must at the same time write his name and address on a slip, which he shall enclose in a separate envelope, seal the latter, and write outside it the motto or *nom de plume* he adopts for his essay. The essay and the envelope containing the slip to be sent in under one cover, to the undersigned.

The envelopes containing the names of the authors will be opened in the presence of the Committee after the judges have made their award.

All essays must be in the hands of the undersigned not later than November 15th, 1898. The selected essay will become the property of the Committee, which reserves to itself the right to make such use of it as it thinks fit.

The Committee also reserves to itself the right to purchase for a sum not exceeding fifty guineas any of the other essays.

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Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

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OUT OF THEIR
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Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895*,

Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 „
Ash . . . . . 2·73 „

For Price, &c., apply to the
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Yield of Gas per ton . . . . . 10,500 cub. ft.
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Illuminating Power . . . . . 16·3 candles.
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Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

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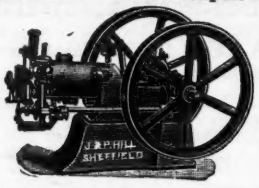

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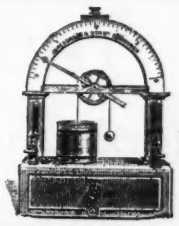

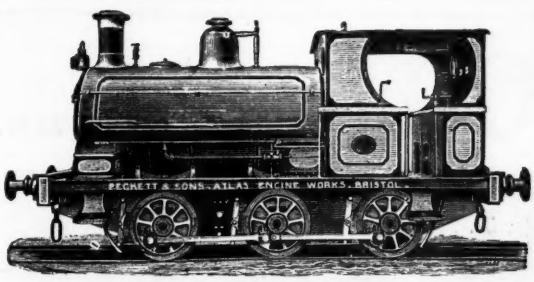

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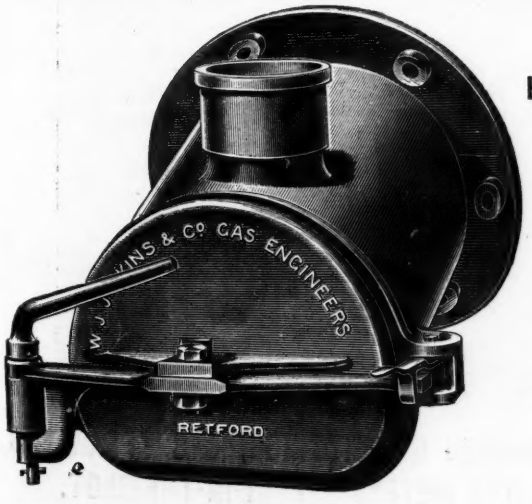

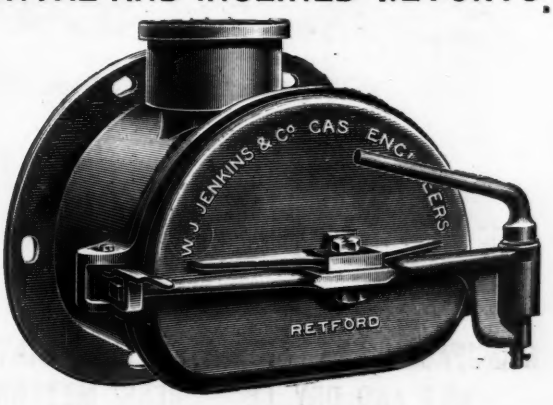

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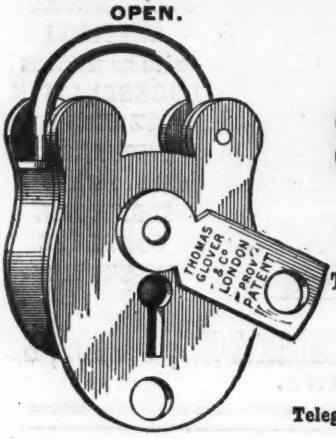

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Prevents Tampering with the

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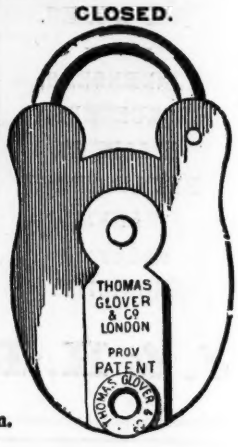

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BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC"*

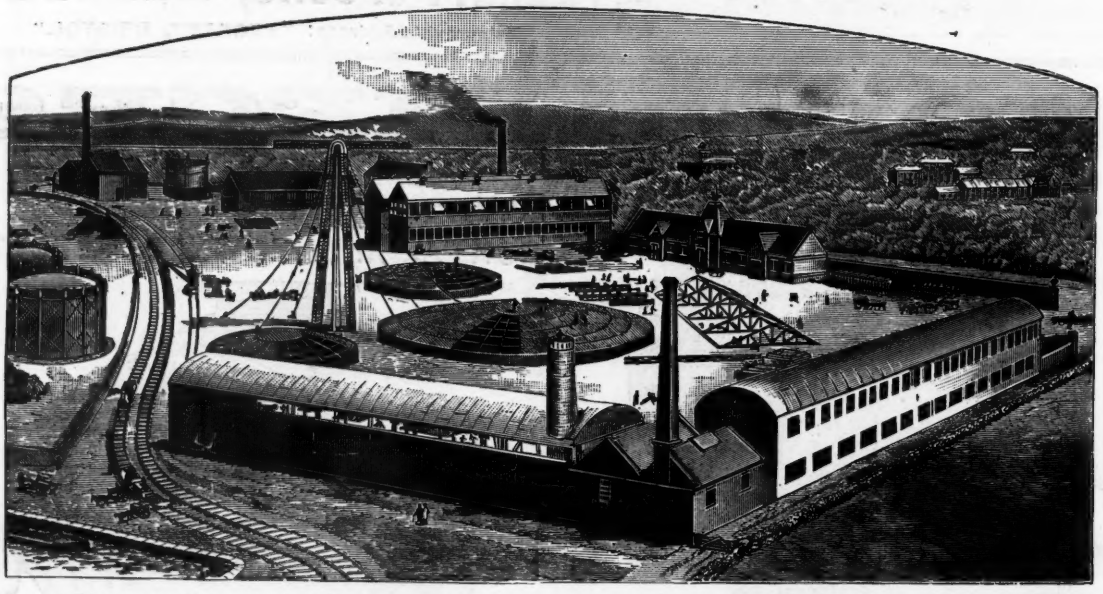
MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."* Telephone No. 3398.

GLASGOW: ARGYLE WORKS, KINNING PARK. *Telegraphic Address: "GASMAIN."* Telephone No. 1823 South Side.

WILLEY & CO., GAS ENGINEERS,

OFFICES: EXETER. WORKS: 248, Kingsland Road, LONDON; James St., and St. Thomas, EXETER.

South Wales Offices: Prudential Buildings, St. Mary Street, CARDIFF.



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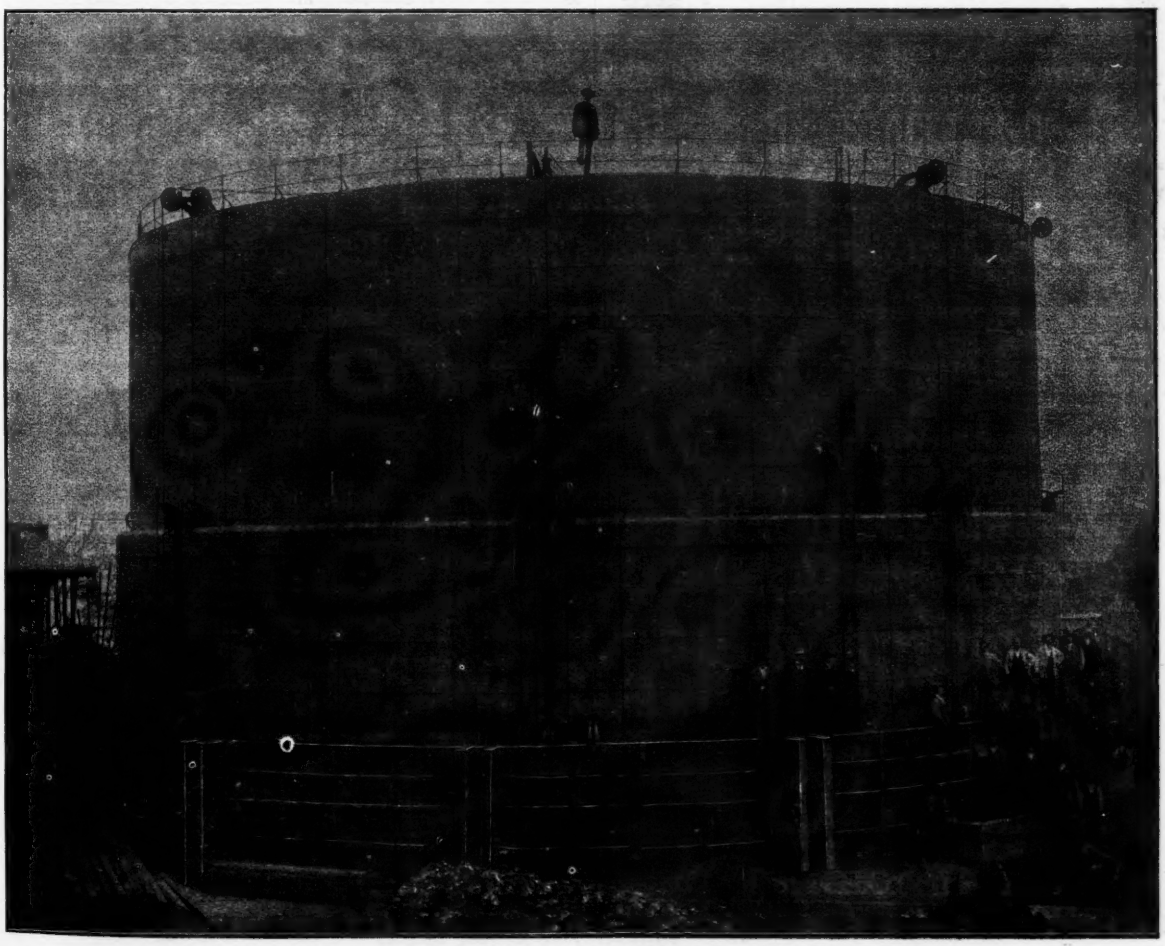

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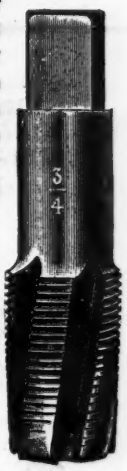

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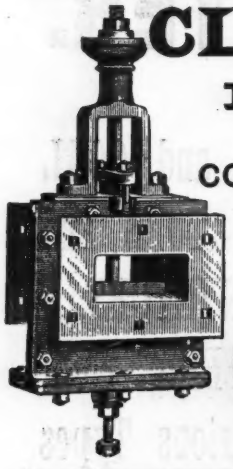

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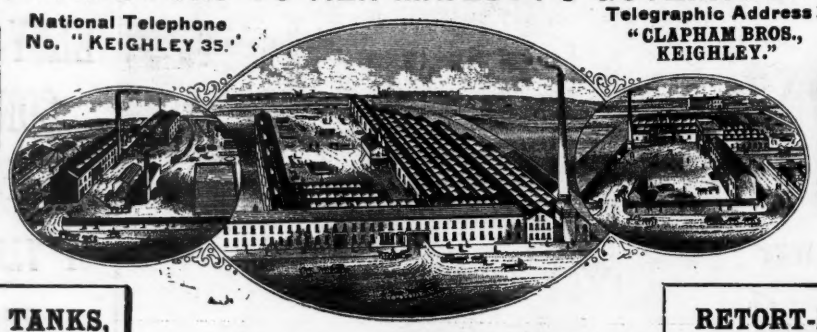

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